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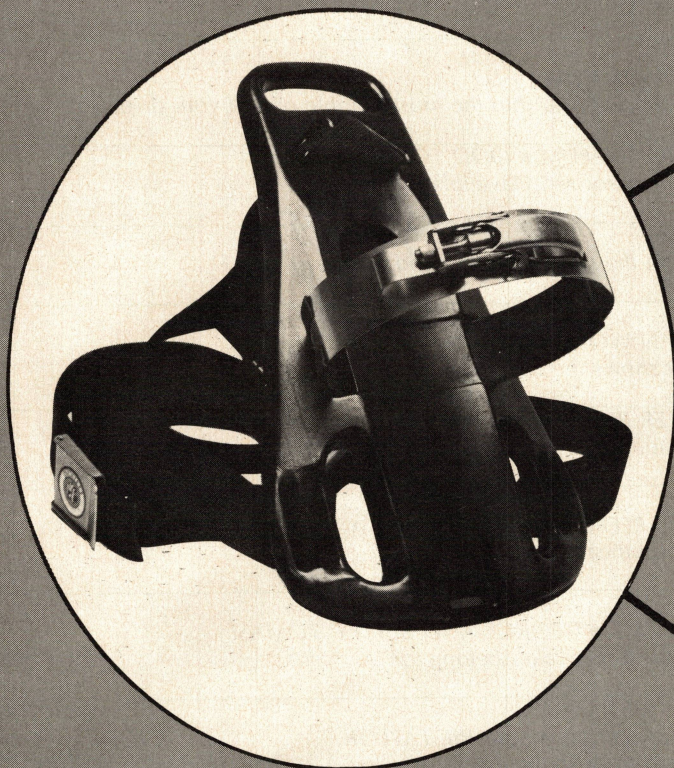
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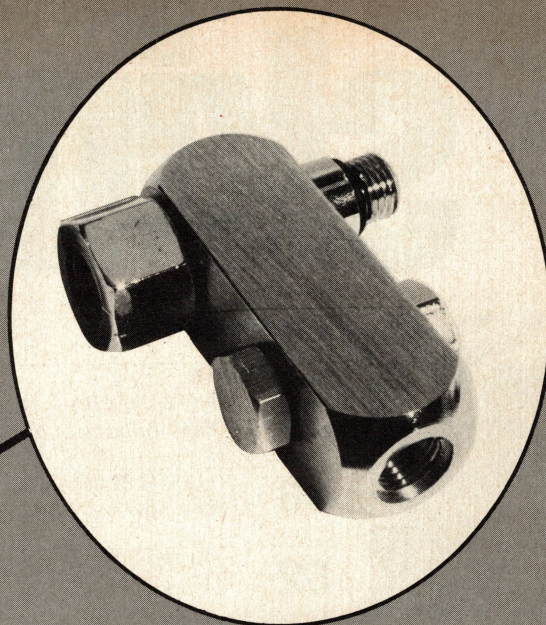
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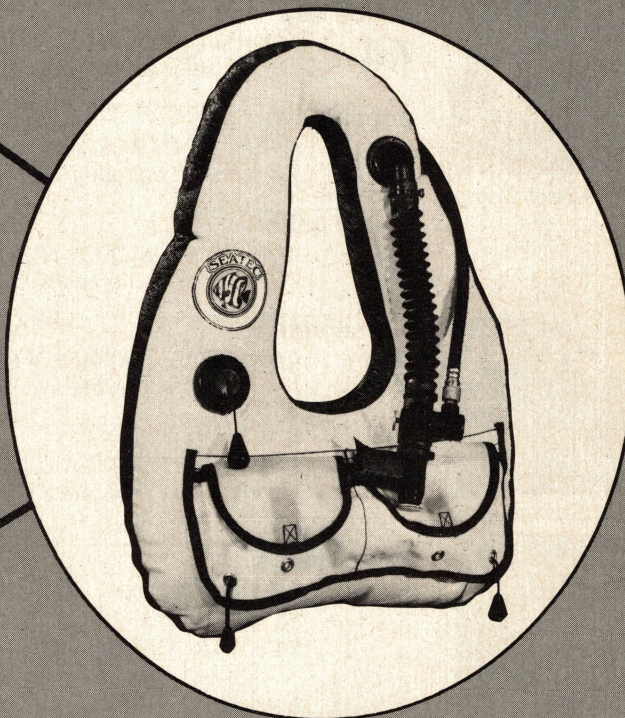
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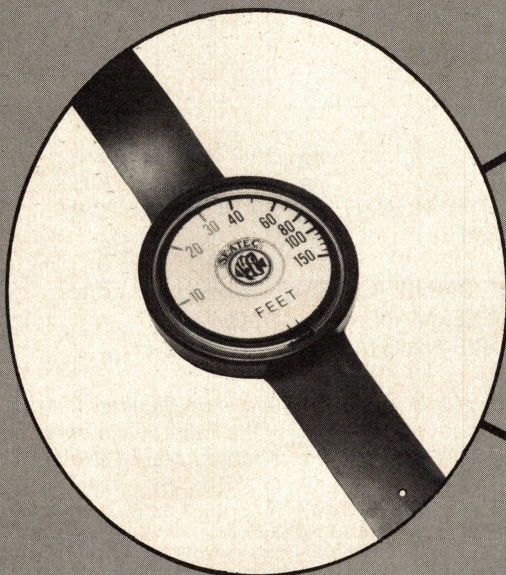
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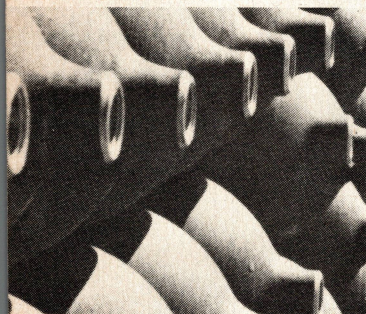
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cover

John Larsen took this photograph of a giant sea turtle in 60 feet of water on Breakers Reef off the beach from the Breakers Hotel, three to four miles south of the Palm Beach inlet. Larsen used a Nikonos camera with a Seacor 21mm lens and a Subsea Mark I strobe.



34/Tanks



44/Reef Savers



58/Salvage Law



66/Natural Wipeout



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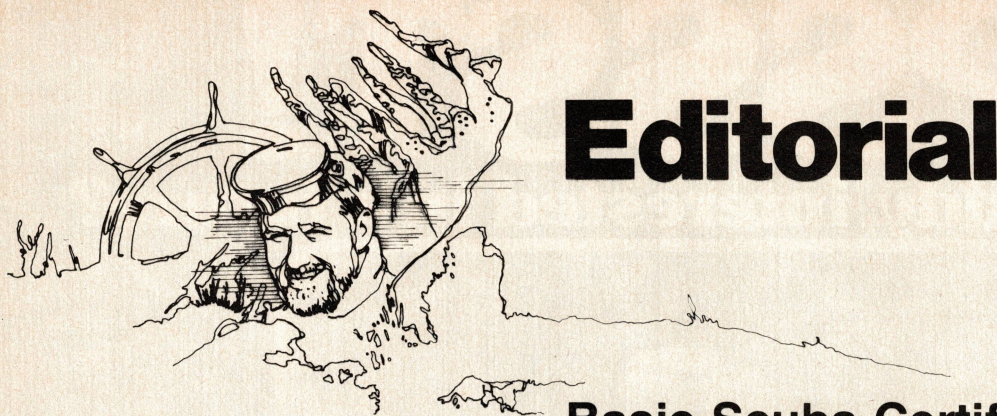
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Basic Scuba Certification is Only The Beginning

by the Publisher

"How long does it take to become a diver?" This seemingly simple question, asked by almost every neophyte, is perhaps the most difficult to answer. It penetrates the heart of our sport and challenges the very foundation of our diver training system as it stands today. Ask the question, and you may get a dozen different and surprisingly diverse answers . . . depending on who is being asked. The problem is that no standard has yet been established for determining when a novice finally becomes a fully qualified, self-sufficient diver capable of handling himself safely in open water without supervision of an instructor.

One thing is for sure, however: a person just graduated from a basic scuba class is certainly far from being regarded as a qualified diver. Too many novices seem to be pouring forth from today's classes under the gross misconception that they are fully prepared to handle anything in the water. It is this attitude of over confidence which sends them off half cocked, only to blunder into some really hairy diving situation which either gives them a terrible scare or ends up in an unfortunate diving accident. You might wonder how anyone could ever be so naive as to consider themselves a diver after barely 32 hours of classroom lecture and pool training, with just two or three brief open water experiences?

It may not be the novice diver's fault completely. There are many factors which contribute toward this "attitude problem." Maybe the student was led to believe that he would actually be a fully knowledgeable diver by the end of the course. Over zealous instructors are sometimes so busy praising the completeness and thoroughness of their course that the students actually begin to believe there's nothing further to be learned after graduation. And what about those dive shop signs and adver-

tisements which claim, "we'll make you a diver in 20 hours for just \$45!" Don't forget that certification card which is given to all grads at the end of the course. It flatly states, "certified diver." This is a misnomer; the card should read "certified novice diver" or "certified scuba beginner" instead. We often wonder how many of these new graduates are told the truth — that a basic scuba course is merely the beginning of their education, not the end. We wonder what they are told about advanced training, about practice and experience, about how long it will take them to make the grade.

We asked Dr. Glenn Egstrom at UCLA, how long he thought it takes the average person to become a fully qualified diver. He said the answer is complex and varies tremendously with the individual and with the person's frequency of diving. Egstrom feels that after a person graduates from a basic scuba class, they should make their next ten to twelve open water dives under close supervision of a certified instructor or veteran diver. Then, another year of steady diving (minimum of two dives per month) is needed to gain personal confidence and experience which breeds the necessary wisdom and "water sense" of a seasoned diver. The entire learning experience may span two years or more, and encompass some 40 to 50 open water dives. With this kind of "bottom time" under his belt, a novice can begin thinking of himself as an experienced diver.

Many instructors believe it takes longer. They place heavy emphasis on the open water experience. "Classroom lectures and symposiums may be fine for expanding the mind, but there's nothing like getting out there in the water and doing it!" exclaimed one advanced diving instructor. Another old timer, who had been diving for 20 years, claimed that you never stop learning. Every dive offers a new lesson, if you're alert

enough to catch it. The British Sub-Aqua Club requires more than 100 dives to qualify for testing for 1st Class Diver.

The big push today is on advanced diver training with plenty of open water experience. This is obviously the quickest way to bridge that gap from novice to experienced diver. I've seen people graduate from L.A. County's ADP course as better divers than some "instructors" I know. The specialty courses now being offered by many shops and schools is still another way to become a really good diver. These programs cover a wide range of underwater interests, including underwater photography, cave diving, wreck diving, etc. Not only do these courses impart specialized diving knowledge, but they also provide good opportunity to perfect basic scuba technique.

It's really difficult to define a precise criteria for qualifying as an "experienced diver." Some people try to measure it by time units, but how can one determine the frequency or regularity of diving that was done in say a five year period. The number of dives seems to be a far better yardstick. Perhaps the ultimate measurement will be a list of skills and accomplishments which a novice must master to qualify. No doubt, some sort of standard will eventually evolve as the instructor agencies continue to refine our training methods.

In the meantime, it is vital that all newcomers to our sport be made fully aware of what it takes to become an experienced diver. They cannot expect to graduate from a basic scuba course one week and make a 200 ft. dive on the Cozumel drop-off the very next! They must be made to understand that the C-card is merely proof of basic training — not a passport to the wreck of the *Andrea Doria*. It takes a lot of training, hard work, and a lot of open water experience to become a good diver. Enthusiasm is no substitute for experience.

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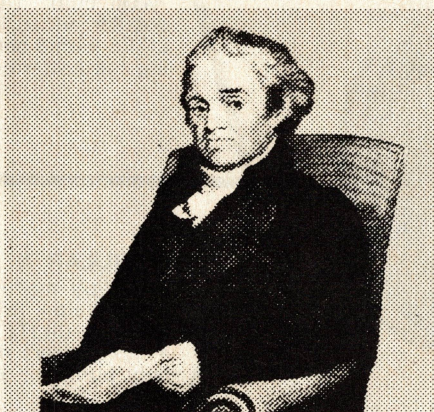
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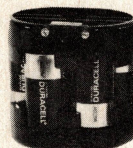
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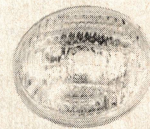
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Underwater Forum

Plan Those Deep Dives — You Can't Turn Back the Clock

... In his September SDM account of a disastrous bout with the bends, Ron Johnson captured my deepest sympathy and concern! I wonder, however, how many readers were scared away from Deep diving (I don't particularly encourage it in sport diving) instead of getting the real message!

Never have I seen such a clear illustration of how to find trouble by breaking so many rules of diving and common sense. A man with Ron's experience and qualifications should have known better. Let us review some of his mistakes:

Physical condition — He was hypertensive with a high blood cholesterol. He should not have been diving at all.

Rate of descent — A dive to 255 feet should be planned in order to minimize bottom time, particularly when decompression is not anticipated. From his description it appears that the divers prolonged their descent and thus extended their bottom time.

Monitoring of depth — An arrival at 255 feet should never be a surprise!

Rate of ascent — This should be 60 feet per minute to the point of decompression on the surface. These divers, by ascending as slowly as possible from 150 feet, must have further increased nitrogen absorption.

Bottom time — It should not exceed the no-decompression limit unless decompression is planned. They greatly exceeded the limit; decompression stops were neither planned nor available.

Rule breaking — With deep diving it is particularly dangerous; to do so without immediate access to a chamber is the ultimate mistake.

Deep diving is risky but the risk can all but be eliminated by careful planning and adherence to basic dive rules. Let us all learn by this unfortunate experience. I, too, wish there were a way for Ron to turn back the clock.

JIM McCOOK, D.D.S.

SOLANA BEACH, CALIF.

Miniature Bug Spotted

... I was really amazed to see the story on the rare Caribbean red lobster. I have been a tour guide for V.I. Divers in St. Croix for two years. I have spotted that same lobster for all this time and no one



has known what it was until I saw the article written by Bruce Bowker in your August issue.

There are at least three or four of them I have spotted in 35 feet of water living in a pile of rocks under the Fredricsted Pier on the west end of St. Croix. The bugs were really quick when I tried to catch them for a closer look and now I finally found out what they are.

RON CUTLER ST. CROIX, U.S.V.I.

Diving and Disorders

... At the present time I am taking lessons in scuba diving. In the past I have had a fairly severe case of ulcerative colitis which is healed at the present time.

I am a registered nurse and am curious if the pressure from diving will have any adverse effects on/in the abdominal area after a physical problem such as this. Also, if the colitis becomes active again, what then?

NAME WITHHELD

There is no reason to think that diving or pressure per se would bring on or aggravate ulcerative colitis. While the cause of this disorder is unknown, attacks can be precipitated by emotional or physical stress. Therefore, if diving involves much anxiety, it should be avoided. Conversely, if it is a pleasurable experience and works off tensions, it could be protective. Don't dive if fatigued, and do avoid excessive exertion.

Certainly refrain from diving during acute flare-ups of colitis, for like any illness, it may render you more susceptible to bends, narcosis, etc.

CHARLES V. BROWN, M.D.

... Being a controlled diabetic for the past 20 years and scuba diver for the last four years, I have taken great interest in your recent issues concerning diabetics and diving.

There are good arguments being voiced by each opposing faction. The major point against diabetic divers is the fact that he or she may have a hypoglycemic episode while underwater. As has been stated in column letters there are certain precautionary methods to avert this from happening...

Beyond those methods, I carry a tube of "Instant Glucose" in my B.C. pocket.

(Continued on Page 15)



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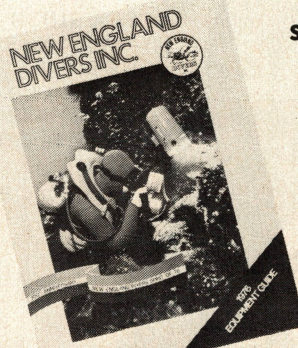
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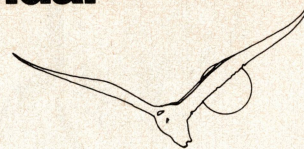
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Calendar



November 1
14th Annual International Underwater
Photo Competition (Contact: Underwater
Photographic Society, P.O. Box 7088,
Van Nuys, CA 91409)

November 5-7
8th International Conference on U/W Edu-
cation, Convention & Performing Arts
Center, San Diego, CA (Contact: NAUI
Hdqs., P.O. Box 630, Colton, CA 92324)

November 7-11
1st International Meeting on Underwater
Activities, Eilat. (Contact: Red Sea Un-
derwater 1976, P.O. Box 29234, Tel Aviv,
Israel)

November 9-11
CNCA Conference, University of Illinois,
Urbana-Champaign, IL (Contact: Bernard
Empleton, CNCA Hdqs., 220 Ashton
Rd., Ashton, MD 20702)

November 13-14
Florida Skin Divers Association annual
meeting, Jacksonville. (Contact: Skip
Elmes, Bold City Divers, Inc. P.O. Box
52171, Jacksonville, FL 32201)

January 5-8
8th Int'l Conference on U/W Archaeology,
Government Conference Centre &
Chateau Laurier Hotel, Ottawa, Ont.,
Canada (Contact: Jervis D. Swannack,
1600 Liverpool Court, Ottawa, Ont.,
Canada)

January 15
Entry deadline, Illinois Council Photo Con-
test. (Contact: Gary Chesnut, P.O. Box
466, Dekalb, IL 60115)

January 15
Inland Divers Association 4th Annual Film
Festival & Underwater Photography Con-
test. (Contact: IDA, Doris Williams, 6215
Dodson Ter., Ft. Worth, TX 76135)

March 5
Boston Sea Rovers '77, Boston, MA (Con-
tact: Bunky Hodge, 174 Beech St., Rock-
land, MA 02370)

April 16
Underwater Symposium 77, Harvard Uni-
versity Science Center, Cambridge, MA
(Contact: Fred Calhoun, P.O. Box 291,
Back Bay Annex, Boston, MA 02117)

April 16
Underwater Film Review, John Hancock
Hall, Boston, MA, 8 p.m. (Contact: Fred
Calhoun, P.O. Box 291, Back Bay Annex,
Boston, MA 02117)



The suit that separates the men from the cold

When you play for keeps like the United States Special Forces, the Navy, and oil well riggers in the north Atlantic, you need a no-nonsense cold water dry suit you can depend on. And that suit is the **VIKING VARIABLE VOLUME DRY SUIT**. It's the cold water business suit the pros depend on to provide them with warmth and freedom of movement that no other dry suit can offer. The Viking Variable Volume Dry Suit was not created by some fancy designer to make you look pretty—it was developed by professional divers who knew exactly what they wanted in a dry suit and set out to get it. Here are the cold facts:

Developed by cold water experts

The Viking Dry Suit was developed in Norway by professional divers for protection against the frigid depths of the North Sea. It continues to be manufactured in Norway in order to maintain the rigid quality standard established by those divers. The Viking Dry Suit is offered in two models—the Viking Variable Volume and the Viking Navy—both of which are available in standard and heavy duty versions.

If you've ever had to climb in and out of a wetsuit in freezing weather you know what a bone-chilling experience it can be. One of the great advantages of the Viking Dry Suit is that you'll remain warm and dry before, during, and after your dive with the thermal insulation the suit provides.

One piece construction

Viking Dry Suits are built in one piece to virtually eliminate leakage so you'll stay dry and comfortable. The suit itself is constructed with sturdy, orange colored rubber coated polyester fabric. All wear points are protected with a double-thick layer of material. After assembling and sewing, the suit is vulcanized into one piece. The light tricot material allows you, the diver, complete freedom of movement.

The suit's smooth surface insures a min-

imum of swimming resistance and makes cleaning a snap. And, if by accident, you should puncture any part of your Viking Dry Suit, you can easily fix it at the diving site. Just slap on an innertube patch and resume diving.

Maximum comfort—minimum restriction

The Viking Dry Suit has been carefully crafted to give you absolute freedom of movement. You're enveloped in a sheath of insulating air in which undesirable air pockets cannot accumulate. The cut of the suit is full enough to allow you to use a number of layers of warm underwear. Suit squeeze underwater is virtually eliminated. The feet of the suit are made rugged in order to withstand the wear and tear you'll give them.

Automatic buoyancy control

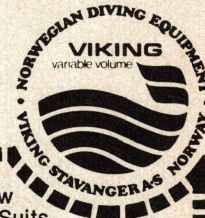
The outlet valve is located on the suit's left arm in a position which enables easy adjustment with the right hand or dumping when both hands are occupied. The valve can be adjusted to vent air, maintaining a higher or lower pressure inside the suit relative to ambient water pressure. This feature eliminates uncontrolled blow-up ascents.

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VIKING variable volume suit

U/W Film Adventure at IQ 8

Mr. Bill Burrud, independent producer of wildlife adventure television series and films, will be the special guest at the Eighth International Conference on Underwater Education in San Diego, November 5-7, 1976.

Saturday, November 6, Bill Burrud will be featured at a special afternoon general session at the San Diego Convention Center. He will be showing selected films, speaking and available for questions from the audience.

Paul Tzimoulis, Editor and Publisher of SKIN DIVER Magazine has designed a captivating film festival for the Eighth International Conference to orchestrate this celluloid adventure.

Saturday, Nov. 6, the curtain will rise at 8:00 p.m. in Golden Hall in the Convention Center for one of the most interesting collections of films ever viewed.

Jack McKenney will be on stage to introduce his film, *Things That Go Bump In The Night*. Filmed in the Caribbean, this film gives you a peek at what happens underwater at night.

Smokey Roberts' film *Truk Lagoon* captures the sleeping giants of the West Pacific and World War II. The litter of

war still capable of destruction and death is explored by the film crew as they seek to uncover more secrets of the war that shattered the peace of these islands.

See by Robin Lehman is a charming look at the creatures of the underwater world as they perform their natural antics. This film has a perspective that will charm even the most hard core diver.

Volcanos in the Sea by Dr. Lee Tepley has incredible underwater footage of a volcano erupting and the lava running to the sea to form new land masses.

The archives of diving have been opened to share some classic moments of early dive history. The ancient Cousteau adventures on wreck diving are narrated by an unbelieving newscaster.

Stan Waterman will close the evening's underwater adventure with his captivating film documentary *The Author Meets Jaws*. Stan challenged Peter Benchley, author of *Jaws* to actually meet the great white shark.

Tickets may be purchased in advance for \$5 from IQ8 Film Festival, P.O. Box 630, Colton, CA 92324. For more information contact: NAUI Headquarters at same address or (714) 783-1862.

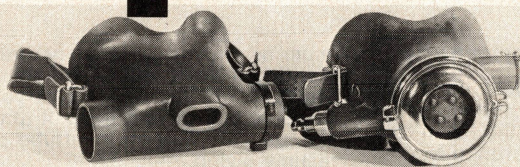


IQ8's special guest, Bill Burrud with one of his fishy friends. The Saturday afternoon general session at the convention center in San Diego will feature Mr. Burrud. He will be showing selected films, speaking and available for questions from those in the audience.

no competition

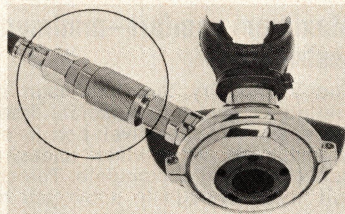
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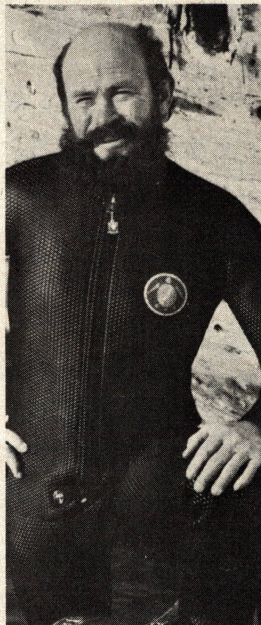
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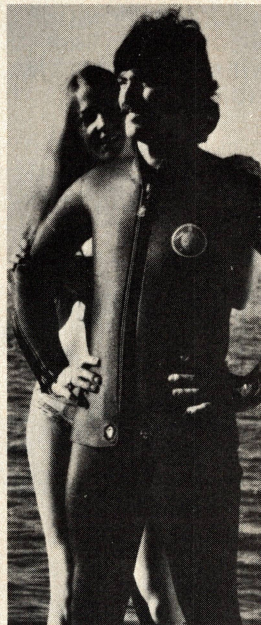
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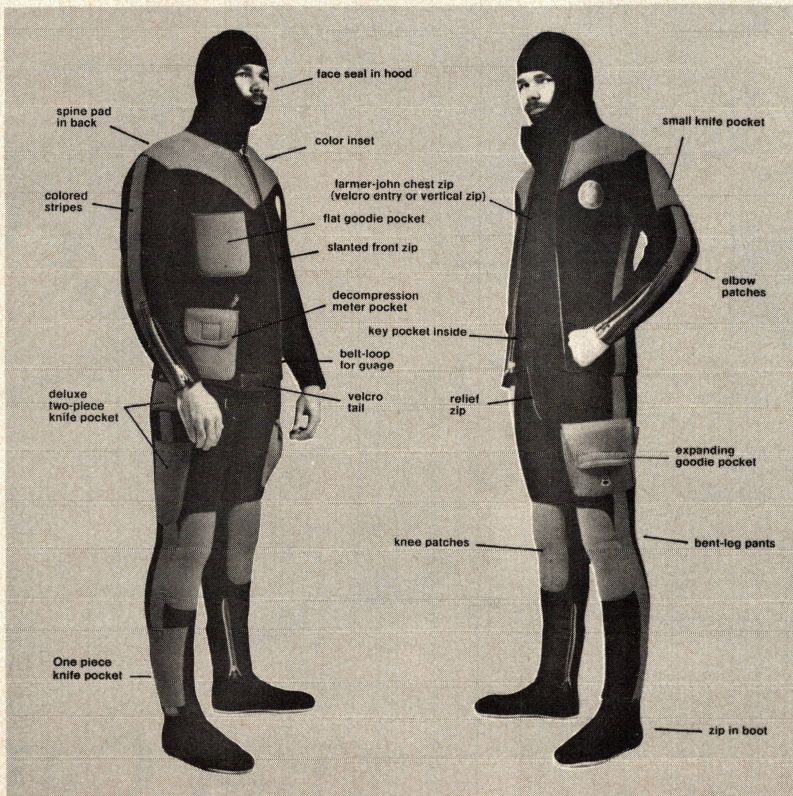
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| Key pocket | Mixed colors in suit (arms, legs, collar etc.) |
| Misc. pockets | 1/4" Body on 3/16" suit |
| Knee patches | 1/8" Suit |
| Elbow patches | One piece suit |
| Spine pad | Canoe style suit |
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| 1/8" Face seal on hood | Slanted jacket front zipper |
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| Beaver tail added to vest | Relief zip on standard or farmer suits |
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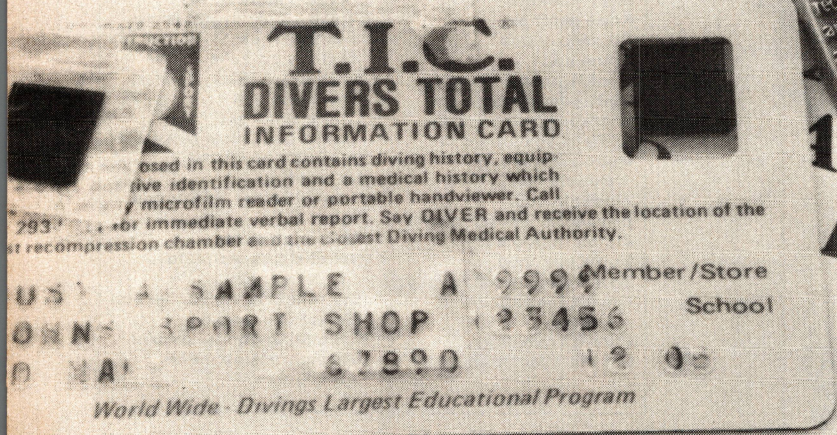
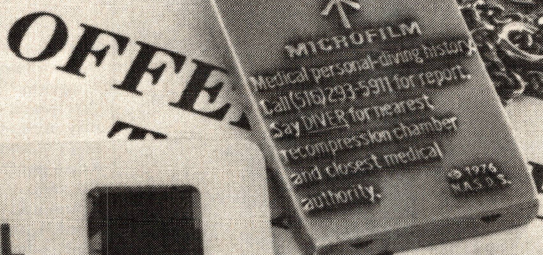
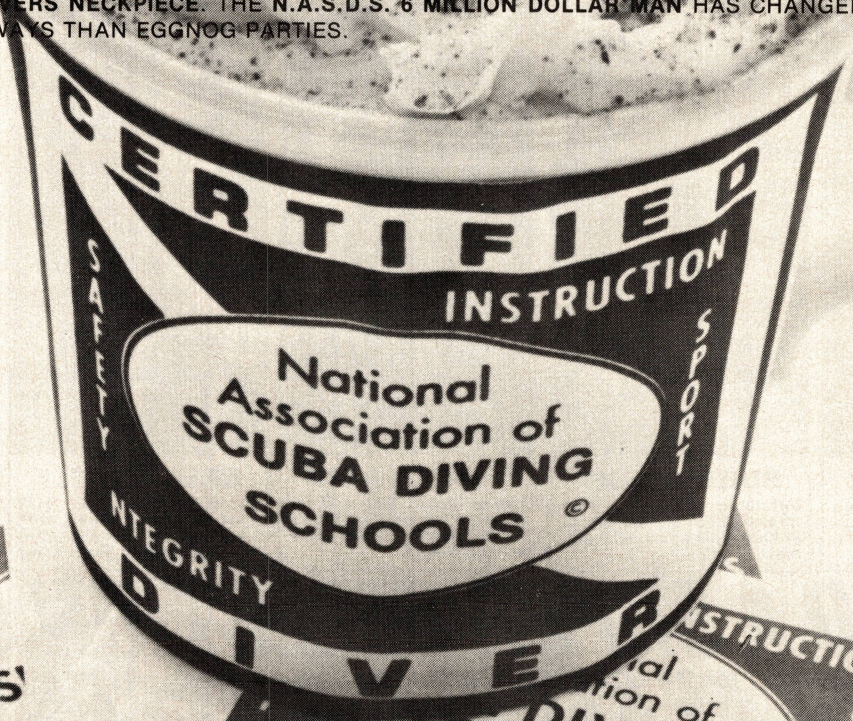
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The Certification Card of the

Underwater Forum

(Continued from Page 9)

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I, for one, plan to continue diving within my physical limits and using every precautionary means available.
BECKY KRUSE PORTLAND, OREGON

Addendum to Diving Docs

... I noted with interest in the recent edition of SKIN DIVER a list of diving doctors. As my area was not listed, I would like to give my qualifications to be listed in the future ... For some years I was an instructor in medicine for NAUI instructor courses and, more recently, I have been teaching some underwater medicine to physicians at the University of Calif. ... I see a number of patients in the San Jose-Santa Clara Valley area who have questions or potential problems in dive medicine.

GEORGE D. RAMSAY, M.D.
SAN JOSE, CALIF.

Dr. Ramsay's specialty is cardiology. He is a member of the San Jose Medical Clinic, 45 South 17th St., San Jose, Calif. (408) 998-5551.

... There are approximately 5,000 scuba divers in the Albuquerque area. The article in the August issue listing diving doctors failed to identify any physicians trained in dive medicine in New Mexico. There are at least several, including Dr. Mora and myself. We both help staff a hyperbaric facility here in Albuquerque (Presbyterian Hospital Center and are fully trained in this specialty.)

OLE A. PELOSO, M.D.
ALBUQUERQUE, NEW MEXICO

Dr. Peloso belongs to the Albuquerque Surgical Group, P.A., 718 Encino Place NE, Albuquerque, New Mexico 87102. (505) 247-3635.

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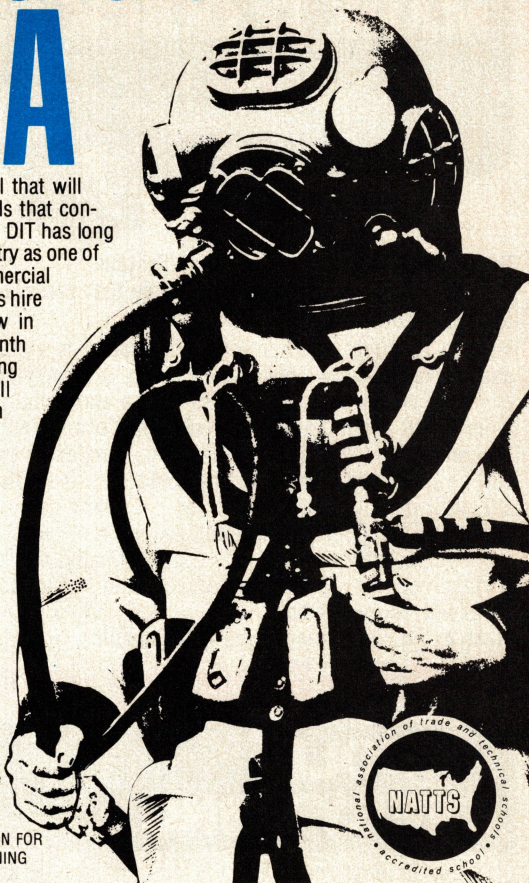
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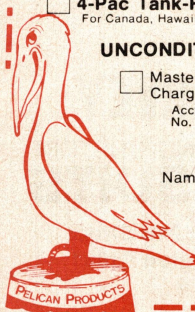
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Underwater Forum

. . . After looking at your August list of diving physicians, I should like to offer my name as a physician from Roanoke, Virginia who is a certified scuba diver and willing to help anyone in the area who may need assistance from dive related pathology.

JOHN M. GARVIN, M.D.

ROANOKE, VIRGINIA

Dr. Garvin specializes in the emergency and industrial department at the Lewis-Gale Clinic, Inc., 1802 Braeburn Drive, Salem, Virginia 42153. (703) 774-9241.

. . . I would appreciate being included in your next listing of physicians interested in diving and underwater medicine. I might mention two other physician-divers in this community . . . Donald S. Coleman, M.D. and T. Gordon Smith, M.D. C.G. DAUGHERTY BAY CITY, TEXAS

Doctors Daugherty, Coleman, and Smith may be contacted through the Matagorda General Hospital, Bay City, Texas 77414.

Additional Dive Facilities in Utah

. . . I feel it is necessary to respond to the August issue of SKIN DIVER. As owner of one of Utah's largest professional scuba shops — Wolfe's Scuba Centers, we were grossly overlooked by the authors. We have four scuba centers, two in Salt Lake City and one each in Ogden and Orem, Utah. All four centers are PADI training facilities with complete lines of equipment, rental, air, trips and service. Backed with an instructional staff of seven PADI and NAUI instructors.

ELLIOTT WOLFE

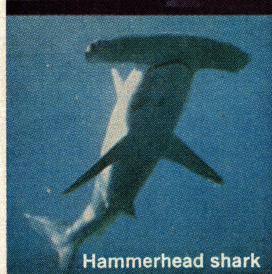
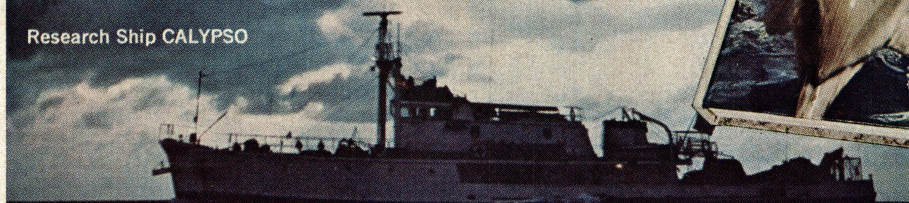
SALT LAKE CITY, UTAH



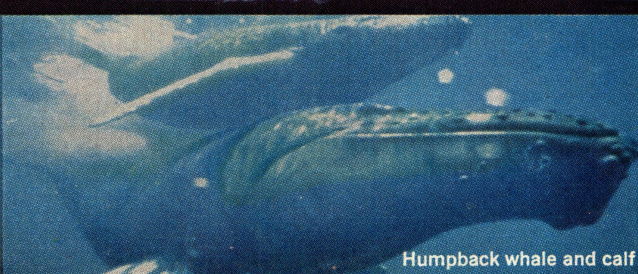
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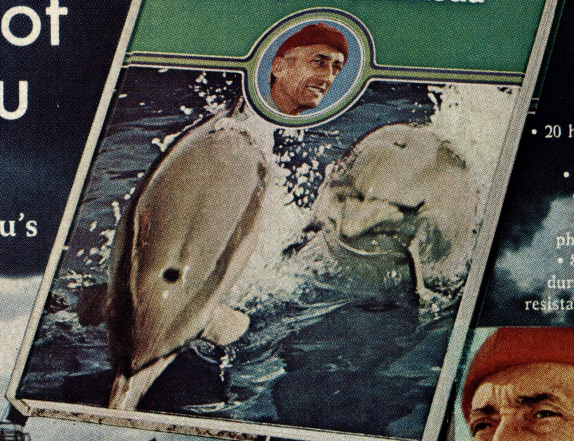
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If the Oceans of Earth should die—it would be the final catastrophe in the story of man and of all life on this planet... maybe fifty years later the last man on earth would take his own last breath. Why imagine such a nightmare about the subject I love most? Because the Ocean can die—and we must make sure that it doesn't. Man exists only because Earth is a "water planet"—liquid water being probably as rare in the universe as life, perhaps even synonymous with life. The Ocean is life. This is why we must change our attitude toward the Ocean. We must regard it as no longer a mystery, a menace, a dark and sinister abode of secrets and wonders. Instead we want to explore how it moves and breathes, how it experiences dramas and seasons, how it nourishes its hosts of living things, how it harmonizes the physical and biological rhythms of the whole earth, what hurts it and what feeds it—not least of all, what are its stories.

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ALLERGIC REACTIONS To Mask & Mouthpiece

BY JOHN E. ALEXANDER, M.D.

A severe intra-oral irritation, vesiculation and generalized inflammation which I attributed to a systemic reaction first called to my attention this clinical entity. Seven years later, I published a small "blurb" in the SKIN DIVER Driftwood column. The response made me aware that this problem was far from unique with me. More than 50 letters, some agonizing, were received and during the past year, I have received drift information on many more cases. One scuba instructor, a very fine observer, stated that 25 percent of her students showed some reaction to regulator mouthpieces. Extrapolation of these statistics would be beyond my mathematical ability, but I would be bold enough to state that there are actually thousands of cases.

The actual chemical constituents of the rubber used in the manufacture of mask skirts or mouthpieces are unknown. However, one of the most common causes of contact dermatitis in surgeons who wear rubber gloves is the anti-oxidant or accelerator Mercaptobenzothiazole. This certainly appears to be a factor in the condition I am describing and its elimination would seem to be very helpful. There could be other etiological agents and constant pressure could be an additional factor. It must be borne in mind that frequent minor insults to body tissue, while not producing symptoms, can be cumulative enough to cause complete sensitization. For this reason, a diver may use a mask, snorkel, or regulator mouthpiece many times without severe reaction until this end point is reached. Then there occurs a contact dermatitis of the face or a severe intra-oral inflammatory process.

TYPICAL CASE — Mask: In the past, this has been known as "mask burn" and was frequently passed off as a necessary annoyance of scuba diving. Characteristically, this varies from a red imprint of the mask skirt contact with the face all the way to a severe disabling erythematous reaction, with vesiculation, severe pain, weeping and crusting of the skin. I saw one case so serious that I suggested hospitalization under the care of a dermatologist. When a severe reaction occurs, it takes weeks before it subsides and a mask can be worn again.

Oral Reaction to Mouthpiece: Minor insults can also occur here without dis-

abling symptoms for long periods of time. However, when the reaction occurs, it looks thus: First, there is a mild burning sensation of the mouth when hot drinks, fruit juices or heavily spiced liquids are taken. This progresses to inflammation, redness, vesiculation of the oral mucosa, gingiva, tongue, and I have seen it extend into the pharynx. The pain is severe! This clinical entity could be likened to a cross between a very severe aphthous stomatitis and trench mouth. (The differential diagnosis could be made by history and microbiological studies.) I have observed cases where eating and talking had to be curtailed.

TREATMENT — The treatment, of course, is to first remove the irritant — stop diving temporarily! If the reaction is severe, consult your physician and show him this article. Symptomatic relief for serious intra-oral reaction has been obtained by using a mouthwash consisting of equal parts of Elixir Benadryl and Milk of Magnesia. This necessitates a medical prescription. Severe reactions on the face require the services of a dermatologist.

Future treatment requires the use of a hypoallergenic mask and mouthpieces. This statement requires a recommendation. While there may be others, I have been working with Dick Bonin, President of Scubapro, who has been aware of this problem and has wanted to help, not to make money but to assist in making diving more comfortable and pleasant. We had talked about making these products from silicone rubber, since in my specialty I have seen this material (Dow Corning Medical Grade Silicone) used in thousands of cases and have never yet encountered an allergic reaction. (This is part of my specialty of Plastic Surgery.) I had also talked with Dick Bonin about eliminating Mercaptobenzothiazole and discovered that he already had in his inventory a gum rubber mouthpiece (Scubapro #245) that did not contain this clinical irritant. This mouthpiece has been tried and found to be hypoallergenic and I recommend it. Two masks have been produced by Scubapro and they are #270 and #H272, which are made of silicone rubber, and these two, I feel, are hypoallergenic and I recommend them. I am not meaning in any way to say that other manufacturers do not make such products; these are the only ones I know of and with which I have had personal experience. I wish to emphatically state that no guarantee is implied that these products will not produce allergic reactions, I simply state that in my professional opinion their use will materially reduce this hazard.

In conclusion, I wish to observe that any individual who is diving or planning to dive, who has any kind of allergic history, should consider the purchase of these mouthpieces and masks. The products are satisfactory and have the added safety factor of being hypoallergenic. Why take the chance? >999

PARKWAY Exposure Garment Quiz

TEST YOUR KNOWLEDGE OF THERMAL PROTECTION

- 1) A "Wet Suit" type exposure garment insulates best when it fits:

☐ A. Very tightly
☐ B. Loosely
☐ C. Snugly

- 2) Worn by a diver at 66 feet a 1/4-inch thick neoprene exposure garment will be:

☐ A. Unchanged
☐ B. Less than 1/8-inch thick
☐ C. 3/8-inch thick

- 3) The outer texture of a Shark-Skin Two suit provides:

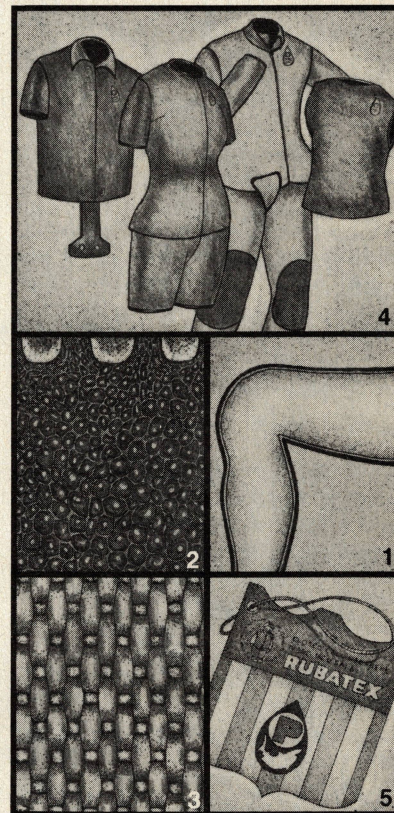
☐ A. Greater flexibility
☐ B. Abrasion resistance
☐ C. A cooling effect between dives

- 4) For personal comfort and safety divers may need exposure garments in:

☐ A. Cold climates only
☐ B. Warm climates
☐ C. Anywhere in the world

- 5) The finest exposure garments are made of neoprene that is:

☐ A. Imported
☐ B. Chemically blown
☐ C. Blown with nitrogen



ANSWERS: 1) "Wet Suit" type exposure garments insulate by trapping a body-warmed layer of water. Loosely fitting suits allow cold water to "pump" through. A very tight fit can inhibit blood circulation and restrict mobility. Parkway suit patterns are made from thousands of body measurements so that they provide the snug fit that insulates best and feels most comfortable. And divers with extraordinary shapes can order custom made Parkway exposure garments that fit snugly like a second skin. C is therefore the correct answer. 2) Exposure garment neoprene rubber contains thousands of tiny cells filled at atmospheric pressure. Upon descent these compress in direct proportion to the ambient pressure. B is the correct answer because at 66 feet the ambient pressure is 3 times atmospheric, compressing the suit to 1/3 its original thickness. 3) Eighty-four "puckers" per square inch give Shark-Skin Two suits amazing hingeability. They bend and flex to help reduce diver fatigue. They also toughen the surface and minimize abrasion. Between repetitive dives the spaces between these "puckers" trap beads of water that help cool the suit and the diver within. Therefore, A, B and C are all correct. 4) Even in the warmest waters prolonged exposure carries off body heat and eventually results in decreased diver efficiency and safety. Because C is the correct answer, Parkway makes a full range of exposure garments. Shirts, shorties and tunics for warm climates and shallow dives. Full suits of every kind for cold climates and deep dives. 5) Durable Rubatex G231 N used in all Parkway suits has proven to be the softest, most flexible and best insulating neoprene for exposure garments. So C is the correct answer.

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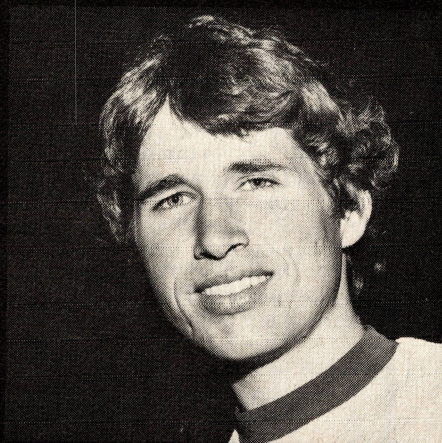
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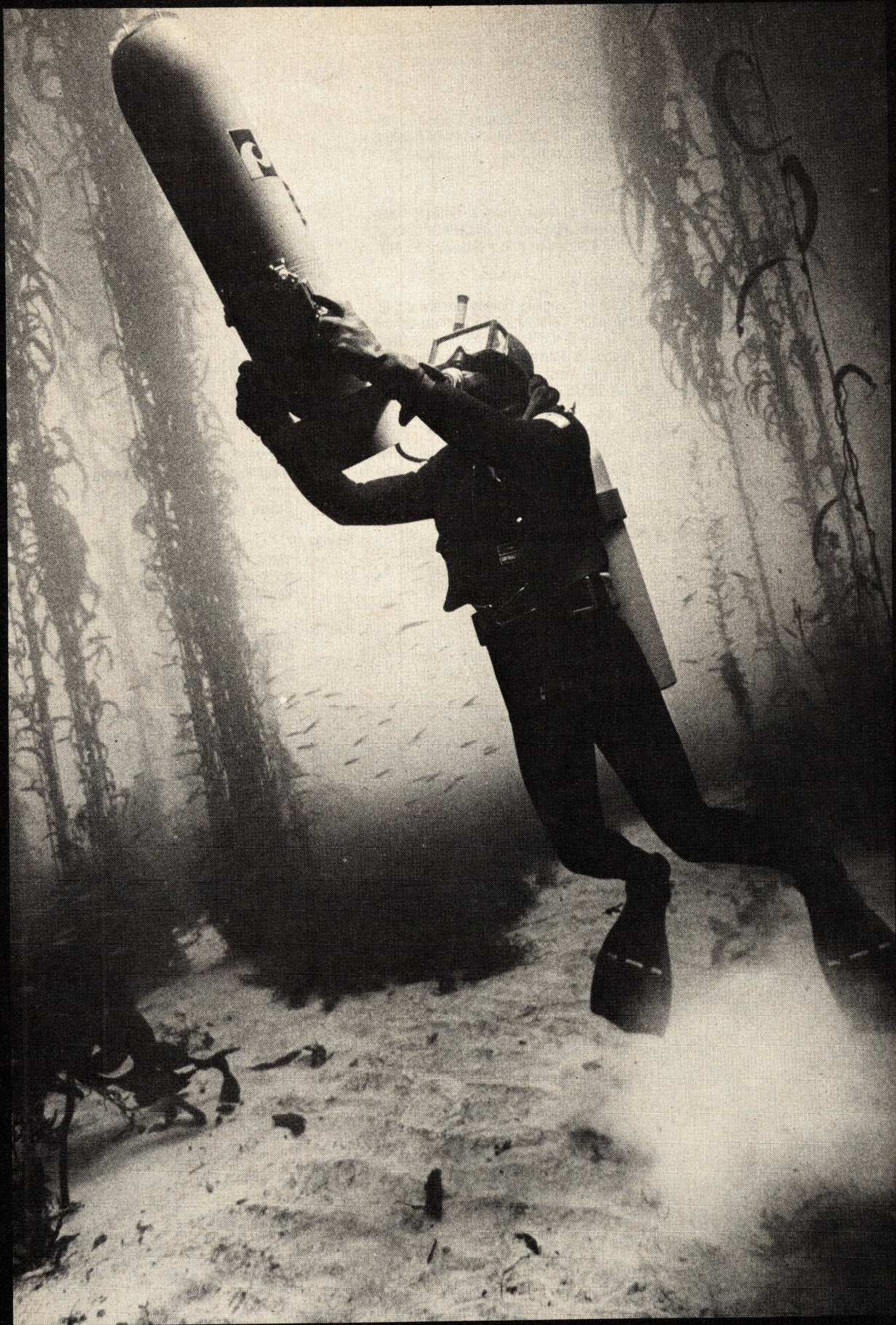
Van Worley

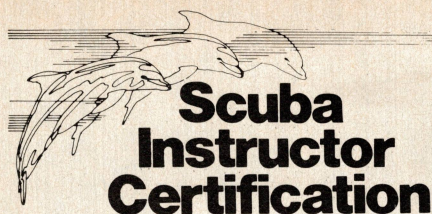
There are few underwater photographers today who maintain black and white photography as their forte. Van Worley, the young California photographer of our Underwater Pictorial, not only prefers shooting black and white, but finds it very rewarding — especially in his native state where visibility is not always very conducive to his art.

Two of these three photographs were taken off Carmel in Northern California. The diver with the diver propulsion vehicle was taken at Pt. Lobos Marine Reserve in 45 to 50 feet of water; the underwater photographer and anemone was taken off Monterey Beach, a popular, sandy beach entry dive site just north of Pt. Lobos, in 125 feet of water. The Japanese tank and diver was photographed in 190 feet of water in the notorious, World War II underwater graveyard, Truk Lagoon.

There is nothing tricky or extremely unusual about Van Worley's photo technique in his still shots. For all of these photographs he used a Nikon F camera, Niko Mar III housing, 24mm lens with corrected dome port. In every instance the photographer utilized only available light and Tri-X film at various ASA values from 400 to 1200.







Scuba Instructor Certification

December 13-19

PADI Instructor Training Course, Jacksonville, FL (Contact: Fla. PADI College, 4593 St. Johns Ave., Jacksonville, FL)

December 20-26

PADI Instructor Training Course, Jacksonville, FL (Contact: Fla. PADI College, 4593 St. Johns Ave., Jacksonville, FL)

January 3-March 11

PADI Instructor Training Course, Jacksonville, FL (Contact: Fla. PADI College, 4593 St. Johns Ave., Jacksonville, FL)

January 9-March 27

26th Los Angeles County Underwater Instructors Certification Course, pre testing Dec. 4-5 (Contact: L.A. County Dept. Parks & Recreation, Underwater Unit, 155 W. Washington Blvd., Los Angeles, CA 90015 (213) 749-6941 ext. 636)

January 9-15, 1977

NAUI Instructor Training Course, Honolulu, HI (Contact: Roy Damron, 954 Kului Pl., Honolulu, HI 96821)

March 4-6, 18-20

YMCA Instructor Certification Institute, Olympia, WA (Contact: Bill Allen, Rt. 8, Box 344-B, Olympia, WA 98502)

April 15-17, 28-30-May 12-14

YMCA Scuba Instructor Institute, Boca Raton, FL (Contact: Doug Curtis, P.O. Box 642, Boca Raton, FL 33432)

November 1-11

SSI Instructor's Clinic, Louisville, KY (Contact: SSI Hdqrs., 1634 S. College Ave., Ft. Collins, CO 80521)

November 1-12

SSI Instructor Clinic, Louisville, KY (Contact: SSI Hdqrs., 1634 S. College Ave., Ft. Collins, CO 80521)

November 6-December 5

YMCA Instructor Institute, San Diego, CA (Contact: Bud Hazen, 8152 Camino del Sol, La Jolla, CA 92037)

November 29-December 10

SSI Instructor Clinic, Key Largo, FL (Contact: SSI Hdqrs., 1634 S. College Ave., Ft. Collins, CO 80521)

December 5-10

NASDS Clinic, Florida (Contact: NASDS, P.O. Box 7666, Long Beach, CA 90807)



April 30-June 26 (6 weekends)

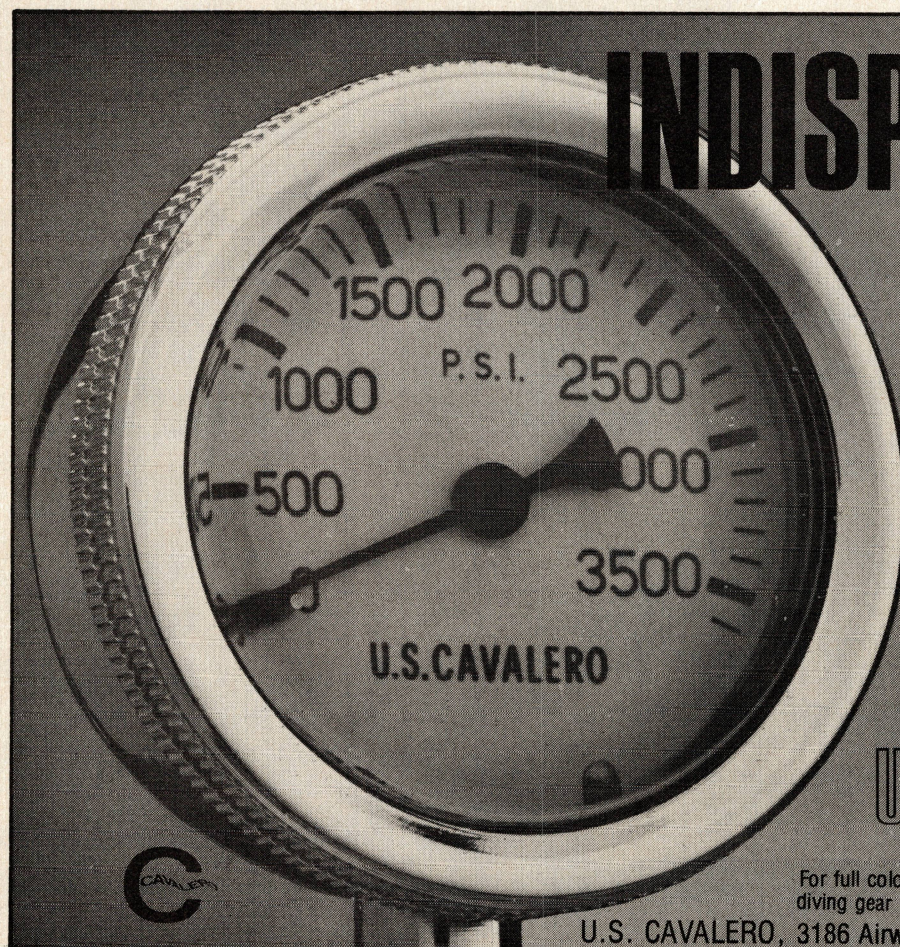
NAUI Instructor Training Course, Rockport, MA (Contact: John S. LeClair, 78 Circuit Rd., Medford, MA 02155)

May 21-27

YMCA Instructor Institute, Key West, FL (Contact: Tom Mount, P.O. Box 1547, Key West, FL 33040)

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The names of Death Valley are names born of despair: Furnace Creek, Lostman Springs, Coffin Canyon, Funeral Mountains. One acrid, brackish pool called Badwater is actually 280 feet below sea level—which is just another way of saying as close to Hell as a man on earth can get.

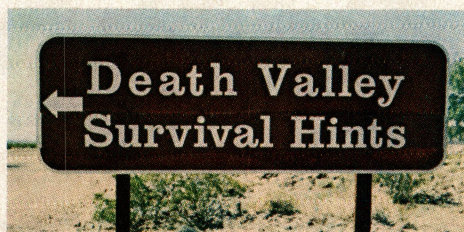
A Sober Warning:
Please be warned before you set

And somewhere in this desolate jumble of earthquake debris, lava flows, sand dunes and salt flats—the hottest, driest hole in the Western Hemisphere—is hidden a case of the wettest whisky in 87 lands: Canadian Club. If you're up to the adventure, you might try to find it.

out, you'll be trespassing in a world apart. A world where 120° in the shade is common. Where surface temperatures of 190° can melt the rubber soles of your shoes. And your bare hand touching a simple metal tool can mean a painful third degree burn. The fierce desert heat twists and warps reason. Even in this age of "air conditioned comfort," it remains capable of snuffing out the lives of the unwary.



Some Valley residents have had thousands of years to adapt to its desolate conditions.



Your Route to the Treasure:

Head south out of Furnace Creek. Past Badwater. Past Devil's Golf Course. Past Dante's View. South of Saratoga Springs, turn right on the road just outside the boundary of the Death Valley National



The relentless desert sun plays tricks with the camera's eye near Furnace Creek.

Monument. In less than a mile, you'll find an old road that leads straight up into the hills. Soon you'll come to a fork. To the left the old road continues. To the right it becomes a wash. Up that wash is a shady spot where you can rest before starting your



The actual case of C.C. being buried 18 inches beneath the desert floor.

final assault.

While you're sitting there, you'll notice an ancient rock through which centuries of relentless erosion have carved a natural

hole. Proceed 144 paces up the wash from that rock. Then turn toward the setting sun. Now take thirteen more paces toward that ball of fire that's been trying to drive you out of the Valley all day.

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A DIVE AT THE UNDERWATER ZOO

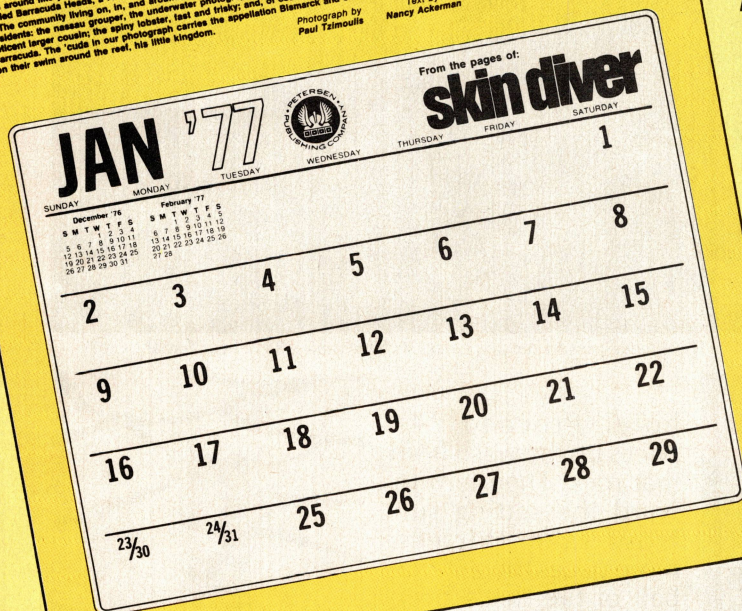
Ever dream of diving on a reef where the critters are friendly enough to be hand fed and they follow you around like your pet dachshund? If you have, then the answer to your dreams may be a place called Barracuda Heads, a reef off St. John in the Bahamas. The community living on, in, and around Barracuda Heads is made up of a variety of friendly residents: the nautilus grouper, the underwater photographer's dream; the reef's namesake, the barracuda; the spiny lobster, fast and tricky; and, of course, the reef's namesake, the barracuda. The guide in our photograph carries the appellation Bismarck and often accompanies divers on their swim around the reef, his little kingdom.

Photograph by
Paul Taimouls

Text by
Nancy Ackerman

From the pages of:

skin diver



actual size of
calendar
is 11" x 17"

Scuba I.Q.

Test Your Dive Knowledge

What's Your Freshwater Diving IQ?

There are many places to dive besides the ocean. Divers slip beneath the waters of lakes, rivers, quarries, springs, sinkholes and other bodies of fresh water. Test your knowledge of diving in inland waters by answering the following questions. Answers are on the following page.

- 1) **An ocean diver on an initial freshwater dive should:**
 - ☐ A. Easily handle the freshwater dive situation.
 - ☐ B. Receive an orientation to the freshwater environment.
 - ☐ C. Only dive with a local dive instructor.
- 2) **Freshwater dive activities are limited to:**
 - ☐ A. Wreck and ice diving.
 - ☐ B. Spearfishing and ice diving.
 - ☐ C. All general underwater activities.
- 3) **Typical freshwater dive conditions in the central U.S. are:**
 - ☐ A. Cold, clear water.
 - ☐ B. Warm, turbid water.
 - ☐ C. Cold, turbid water.
- 4) **The principal factors affecting visibility in freshwater diving are:**
 - ☐ A. Pollution and plankton.
 - ☐ B. Silt and plankton.
 - ☐ C. Algae and silt.
- 5) **Using exactly the same equipment used to dive neutrally buoyant in salt water, which of the following weight adjustments must a diver make to be neutrally buoyant in fresh water:**
 - ☐ A. Add weight amounting to approximately 2½% of the total weight of the diver and equipment.
 - ☐ B. Subtract weight amounting to approximately 2½% of the total weight of the diver and equipment.
 - ☐ C. Leave the weight unchanged.
- 6) **When using the U.S. Navy Decompression tables for freshwater diving:**
 - ☐ A. Add 3% of the depth to the depth.
 - ☐ B. Subtract 3% of the depth from the depth.
 - ☐ C. All no-decompression limits must be reduced by 3%.
- 7) **An abrupt change in water temperature with depth in freshwater lakes is:**
 - ☐ A. Generally predictable.
 - ☐ B. Completely unpredictable.
 - ☐ C. Seldom encountered.
- 8) **In freshwater lakes, fish would normally be encountered:**
 - ☐ A. In deep water in the summer and in shallower water in spring and fall.
 - ☐ B. In shallow water in the summer and in deep water in spring and fall.
 - ☐ C. At all levels during all times of the year.
- 9) **When excessive nutrients enter a body of water and cause increased plant growth which dies, the animal life:**
 - ☐ A. Is killed.
 - ☐ B. Flourishes.
 - ☐ C. Is unaffected.
- 10) **Wood and metal objects submerged in fresh water:**
 - ☐ A. Deteriorate at the same rate as those submerged in salt water.
 - ☐ B. Deteriorate at a faster rate than those submerged in salt water.
 - ☐ C. Deteriorate at a slower rate than those submerged in salt water.
- 11) **During entries from shore in fresh water, which items cause divers to take the greatest precautions:**
 - ☐ A. Waves and drop-offs.
 - ☐ B. Mud and debris.
 - ☐ C. Aquatic animals.
- 12) **When diving in freshwater lakes, divers are most concerned about the hazard of:**
 - ☐ A. Dangerous aquatic life.
 - ☐ B. Polluted water.
 - ☐ C. Heavy boat traffic.
- 13) **When diving in a river, the strongest current will be encountered:**
 - ☐ A. On the outside of a bend.
 - ☐ B. On the inside of a bend.
 - ☐ C. In mid-channel.
- 14) **Ice diving is a wintertime activity enjoyed by freshwater divers. The adventure and excellent visibility attract divers beneath the frozen surface. Which of the following items are required for safe ice diving:**
 - ☐ A. Safety line, tender and safety diver.
 - ☐ B. Knowledge of the dive area.
 - ☐ C. All of the above plus special training.
- 15) **Freshwater divers at times dive at altitudes above sea level. Which of the statements regarding altitude diving is incorrect:**
 - ☐ A. The apparent depth at altitude must be converted to an equivalent depth at sea level for dive planning.
 - ☐ B. The rate of ascent must be increased as the altitude increases to compensate for the difference in pressures.
 - ☐ C. A diver surfacing at altitude when out of breath could lose consciousness from decreased available oxygen.

Scuba I.Q.

Test Your Dive Knowledge

What's Your Freshwater Diving I.Q.?

Answers from questions on preceding page.

- 1) B. Receive an orientation to the freshwater environment. There are many physical and biological differences in fresh water compared to salt water. When diving in any new dive environment, greater safety and enjoyment will be assured by an orientation. A local experienced diver, guide or instructor can provide the needed orientation.
- 2) C. All general underwater activities. Freshwater divers, besides diving under ice and on excellent wrecks, engage in underwater photography, spearfishing, treasure hunting, collecting, and nearly all underwater activities. Contrary to what many people think, there are numerous things to interest divers in fresh water.
- 3) C. Cold, turbid water. Freshwater divers typically have to contend with limited visibility and cold water. In addition, they face swift currents in rivers and problems with altitudes. Freshwater diving can demand complicated skills, procedures and knowledge.
- 4) C. Algae and silt. Algae blooms restrict visibility, especially in shallow water, and fine silt on the bottom can instantly ruin visibility if disturbed. Pollution can also cause or contribute to reduced visibility.
- 5) B. Subtract weight amounting to approximately 2½% of the total weight of the diver and equipment. Fresh water weighs about 1.6 pounds per cubic foot less than salt water. This amounts to a difference in density of about 2½%. Since the diver will displace the same amount of fresh water as salt water and the fresh water weighs less, the diver will need less weight. The amount removed needs to be a percentage of the total weight of the diver and all equipment.
- 6) B. Subtract 3% of the depth from the depth. It takes 34 feet of fresh water to equal the pressure of 33 feet of salt water. The U.S. Navy tables are based on salt water. While the difference is only 3%, it may make a difference in a dive schedule. You may safely subtract 3% of the depth for using the tables for freshwater diving.
- 7) A. Generally predictable. An abrupt change in temperature with increasing depth is known as a thermocline and varies with the season of the year. These seasonal thermoclines can be predicted by divers and one can nearly always expect a thermocline in freshwater lakes.
- 8) A. In deep water in the summer and in shallower water in the spring and fall. Fish remain within certain temperature ranges which change with depth according to the time of the year due to the change in thermoclines. Fish prefer the colder, deeper waters of lakes in the summer and are found nearer the surface when the surface temperature lowers.
- 9) A. Is killed. Chemicals and fertilizers finding their way into lakes and ponds cause a process known as eutrophication, where plant growth is stimulated, but then the plants die, decay and produce a lethal gas which kills animal life.
- 10) C. Deteriorate at a slower rate than those submerged in salt water. Objects are preserved much better in fresh water than in salt water. This makes wreck diving and hunting for artifacts very exciting and rewarding for the freshwater diver. Recovered items hundreds of years old have been preserved in nearly their original state.
- 11) B. Mud and debris. Divers need to be careful when coming into contact with the bottom. If you sink into the mud, a fin could be lost when trying to pull your foot out, or you might sink onto an object which can cut or puncture you. Other concerns include slippery areas, fishing line and lures and insects. These are just a few of the reasons why a freshwater dive orientation is important.
- 12) C. Heavy boat traffic. On many lakes, boating activity is so great the divers are afraid to surface, so they frequently tow a float with a diver's flag directly above. Aquatic life such as cottonmouth snakes, snapping turtles, gars, alligators and catfish, while potentially dangerous, rarely bother divers.
- 13) A. On the outside of a bend. The moving water creates back eddies on the inside of a bend, thereby slowing the current. This causes shoals to build on the inside of a river bend. Avoid the swiftest water on the outside of river bends.
- 14) C. All of the above plus special training. Ice diving is a specialty, and requires special knowledge and techniques in order to be engaged in safely. Prior to any under ice diving, attend an ice diving course or workshop.
- 15) B. The rate of ascent must be increased as the altitude increases to compensate for the difference in pressures. This statement is false. The rate of ascent actually decreases by about two feet per minute for each 1000 feet of altitude. Altitude diving, like ice diving, is a specialty and requires training in order to assure safe participation.

To the experienced salt water diver, freshwater diving at first appears cold, dark and sterile. While it is true that there is much less life to be seen in fresh water, divers can still experience a great deal of excitement and enjoyment. An abundance of life is not the only requirement for fun in diving, but if viewed from the perspective of a challenge, a diver can attempt to seek out and identify the various fish, crustaceans, shellfish and even jellyfish found in fresh waters.

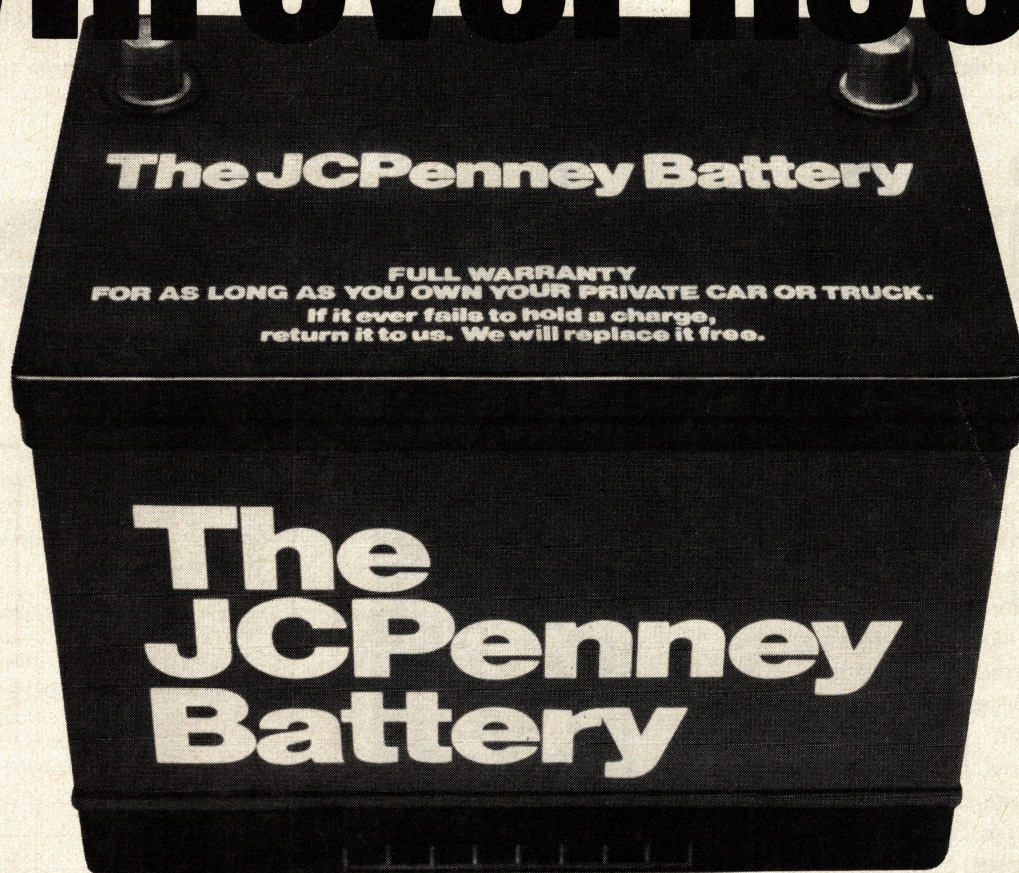
In addition to the excellent wrecks to be found in fresh water, divers seek various artifacts, fossils and relics. Many man made lakes have numerous items of interest beneath the surface left there from construction. Some lakes even have submerged buildings and trains to delight the underwater adventurer.

Rivers offer still other sources of pleasure. River running with floats is a great thrill, and divers even ride the swift currents underwater with scuba equipment. Numerous anchors, items of fishing tackle and other treasures are found in rivers, and what saltwater diver finds gold nuggets in the ocean? Many divers dredge for gold in rivers for fun and profit.

A great many of the underwater caves have been formed by and contain fresh water. While many divers venture into the dark passages to explore and seek adventure, it must be emphasized that cave diving is an extremely hazardous activity for anyone attempting it without special cave diving training. Nearly all cave diving fatalities involve divers who have not been trained in cave diving techniques. If the caves beckon you, enter them only after a special course taught by a qualified cave diving instructor. Any national certifying agency can put you in touch with a qualified instructor.

What is your Freshwater Diving IQ? Inland divers should have scored well and saltwater only divers should have realized that there is much more to freshwater diving than merely a lack of salt. Always seek an orientation to any new diving environment. Next month's exam is on Dive Skills.

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HIGH DIVE in HAWAII

By Dr. Ron S. Nolan



The island of Hawaii is the tropical paradise that most people imagine when they think of the tropics — palms swaying in the balmy trades, coral reefs and white sand beaches — but the big island is also mountain country. Mauna Kea volcano breaks through the clouds at nearly 14,000 feet, and its slopes provide excellent winter skiing. Just below the summit at a height of 13,020 feet lies Lake Waiau, one of the three highest lakes in the U.S. This was the site of our April 4, 1976 dive, which we believe to be the highest dive made in the world.

Even though Hawaii is near the equator, Mauna Kea supported an immense glacier during the marked cooling

of the earth that occurred 2½ million years ago during a period called the Pleistocene. The advance and retreat of the ice cap over a dormant cinder cone gouged out the shallow basin which formed a lake from rain and melted snow. Beneath the bottom of the lake is a layer of permafrost that prevents the water from seeping out through the porous cinder material. Samples of fossil ice, hundred of thousands of years old, have been collected from Lake Waiau.

No fish live in Lake Waiau, but zooplankton abound and thrive upon the luxurious growths of suspended and sedentary algae. Our dive was not only to set the altitude record, but to collect scien-

tific specimens. Ms. Jane Massey, a University of Hawaii graduate student in botany, accompanied our expedition and directed a program of water, plankton, and sediment sampling. Many depths and locations throughout the lake were collected.

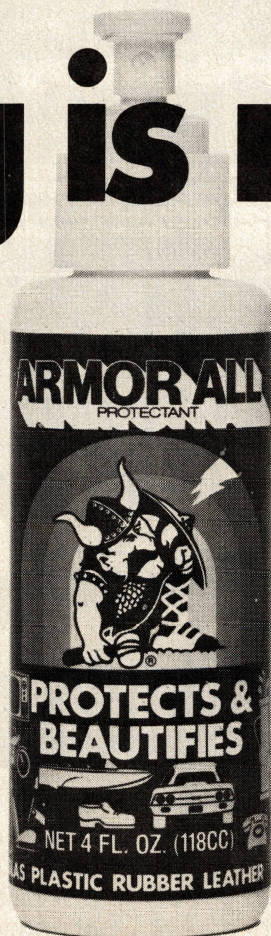
High altitude diving involves several hazards not normally encountered in sea level descents. The lowered atmospheric pressure means that the tendency of dissolved gases to leave the blood stream is increased. During the drive to the summit, outgassing would occur and our first dive in the lake would be the equivalent of a second repetitive dive at sea level; therefore our bottom time was limited.

Diving is rotten.

Your favorite sport takes some pretty special gear that cost you a pretty penny. Then from the top of your mask to the tip of your fins, it all started to rot. All because of water, smog, ozone and the sun's ultra-violet rays that cause deterioration, cracking or discoloring.

Well, before you get that sinking feeling, listen to this. Finally, there's one product (count it, one) that will protect your gear against rot. Armor All protectant. Armor All protectant is honestly unique. It combines with the fibers of — hold your breath now — any rubber, vinyl, plastic, plexiglas or other polymer material and forms a thin, tough shield against rot. Spray it on your mask, suit, fins, air hoses, even your tanks. They'll not only survive a whole lot longer, they'll actually look new again.

And before storing your gear for winter, douse it with Armor All protectant first. Then you'll be ready to dive into spring.



Now take the plunge and send for Armor All protectant.

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Okay, Armor All protectant doesn't sound like just another rotten product.

☐ Please send me _____ 4 oz. bottles of Armor All protectant at \$1.98 each plus 50¢ for postage & handling.

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**IT'LL BE EVEN MORE ROTTEN
IF YOU DON'T TRY ARMOR ALL.**

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SD2

We planned to make our dive as quickly and with as little exertion as possible. It is important to realize that as soon as a diver takes a breath underwater at high altitude he is immediately at the equivalent pressures as if making a dive to the same depth from sea level. This is because the pressure of water varies little with change in altitude. A diver will, therefore, absorb nitrogen at a normal sea level pressure rate, but when he surfaces his respiratory system is again subjected to a lower atmospheric pressure. This disequilibrium favors the formation of bubbles in the blood. In spite of the shallow depth of the lake, Dr. Glen Egstrom of UCLA, was concerned about the possibility of our team contracting the bends. His graduate students at UCLA developed a computer program to calculate our bottom time as a function of ascent time to lake, stops to stage our equipment, and time spent at various lake depths. To assure an ample margin of safety, a 20 minute maximum water time was agreed upon.

Hypoxia is a condition that most divers have occasionally encountered. Its effects are accentuated and the results more dramatic at high altitude, and Mauna Kea skiers and visitors commonly suffer from high altitude sickness. Not only is the amount of available oxygen reduced at altitude, but our respiratory system is confused — it actually does the opposite of what it should to alleviate the problem. Man's breathing center keys upon the carbon dioxide level in the blood — the more CO₂ from exercising, the more the center tells us to breathe. At altitude we produce roughly the same amount of carbon dioxide per unit effort, but there is less oxygen in every breath. Therefore fatigue, headache, loss of awareness and general grouchiness set in. Hypoxia at high altitude can lead to pulmonary edema (fluid in the lungs) which is very dangerous (a subject that is having difficulty breathing should be taken to lower altitude immediately). We dealt with hypoxia by consciously maintaining our breathing rates, breathing 100% oxygen at regular intervals and moving slowly.

The summit of Mauna Kea is cold all year round. Even in the summer, Lake Waiau freezes at night. Ice storms and blizzards come to the summit suddenly and unpredictably. Standing on top of Mauna Kea, huddled in down jackets, yet still shivering, it is hard to believe that only an hour away the perpetual Kona sun is burning the fresh skin exposed by the new style string bikinis. The water was going to be near freezing. We chose O'Neills SuperSuits because of their well-known reputation to keep a diver warm and dry even in the most arctic of yet still shivering. It is hard to believe that our dives must be aborted if anyone flooded their dry suit, but the SuperSuits

(Continued on Page 90)

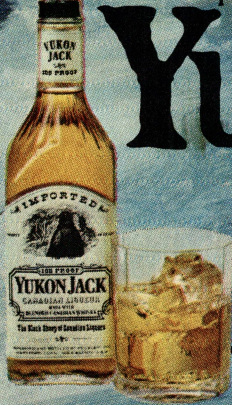


*"I have clinched and closed with the naked
North, I have learned to defy and defend;
Shoulder to shoulder we have fought it
out—yet the wild must win in the end."*

**Robert Service*

The black sheep of Canadian liquors.

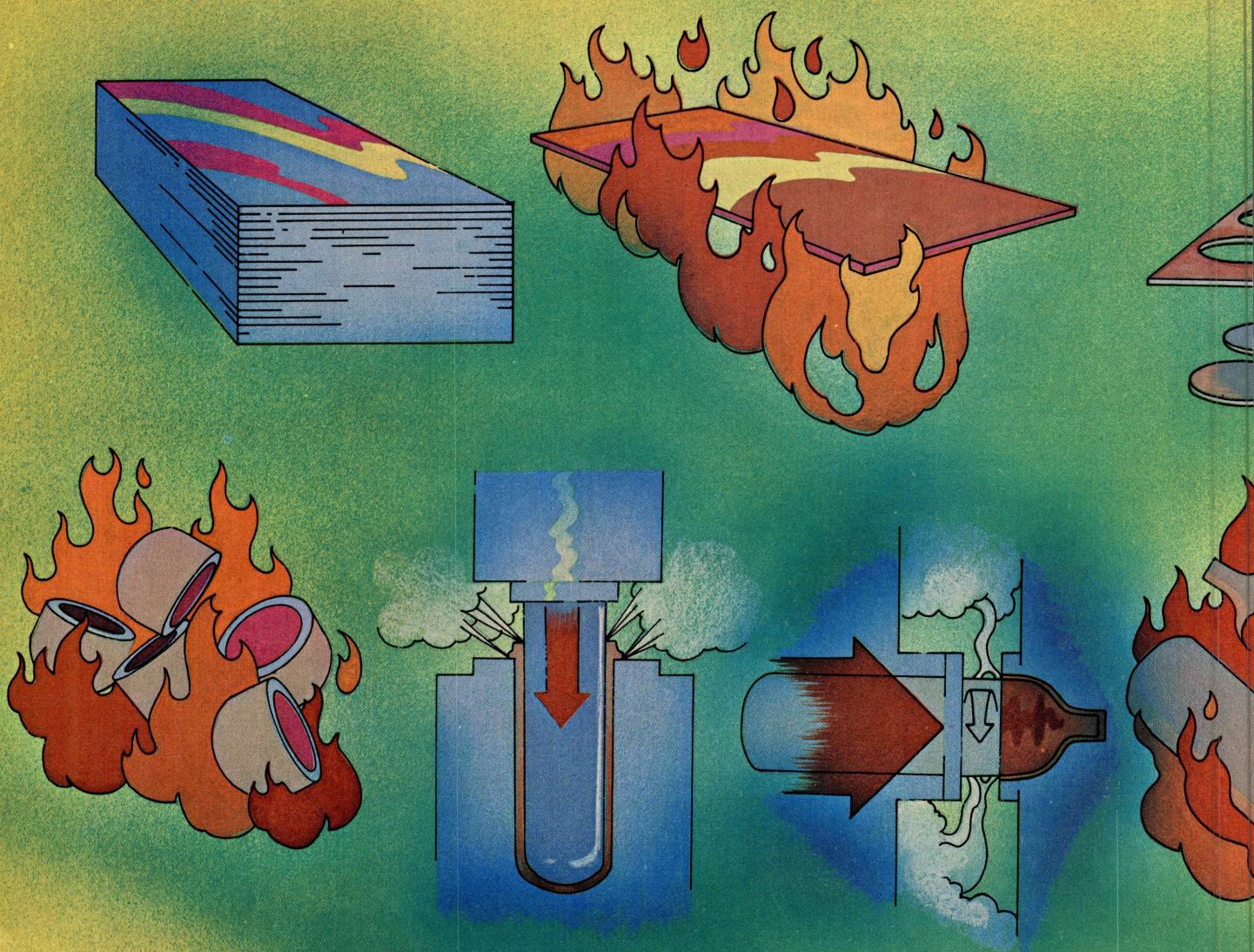
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100 Proof Imported Liqueur made with Blended Canadian Whisky.

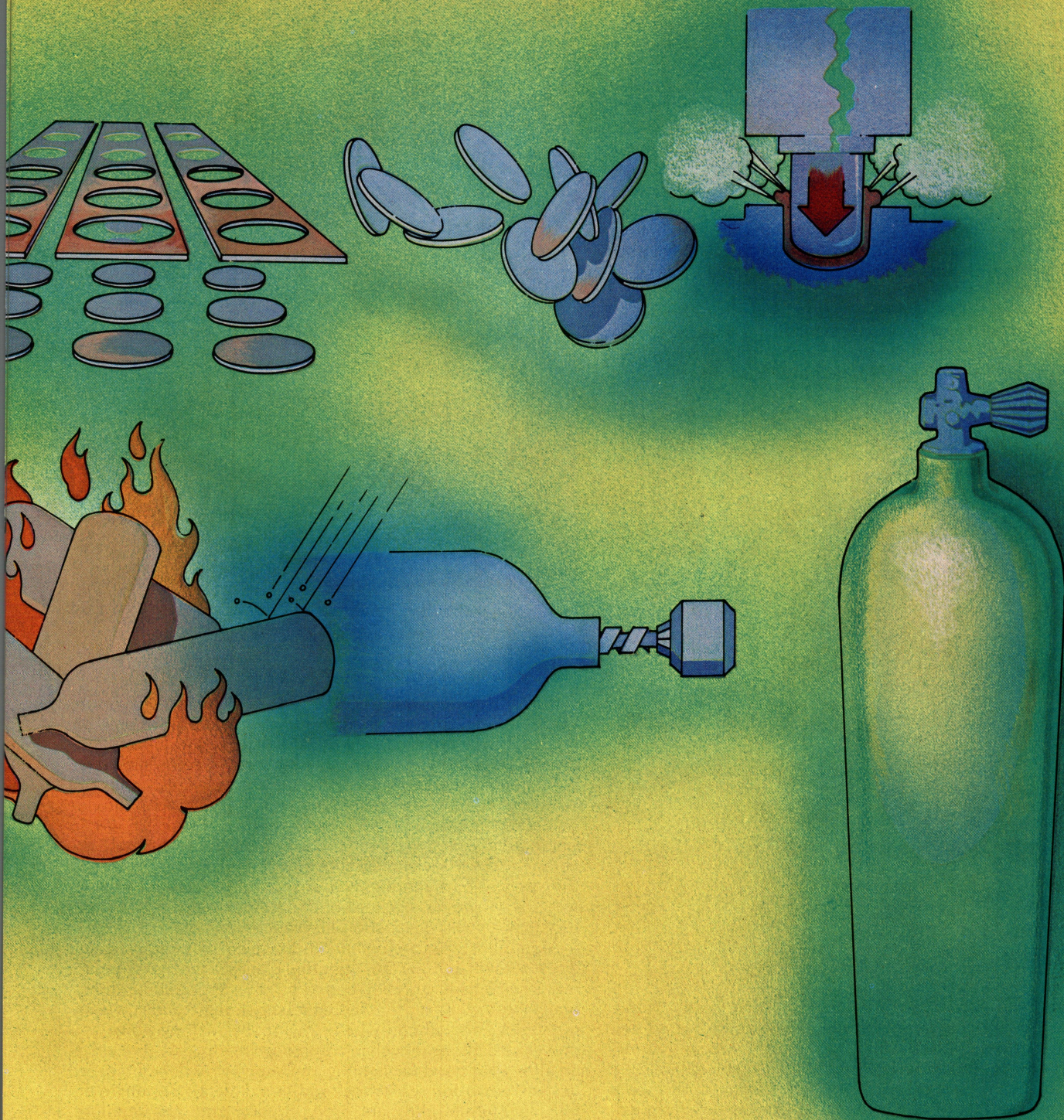
Yukon Jack 80 and 100 Proof. Imported and Bottled by Heublein, Inc., Hartford, Conn. Sole Agents U.S.A. *©1907 Dodd, Mead & Co., Inc.



HOW SCUBA TANKS ARE

Kicked and thumped, sworn at by tired divers, ignored, coated and corroded, but always taken for granted, that lump of metal with a hole in one end hanging from every scuba divers back is a tribute to over one hundred years of applied technology. Surprisingly, the biggest limitation to the development of a practical scuba unit was the lack of a suitable high pressure vessel to store the diver's air supply.

Through the years many men tried and failed to overcome the self-contained air supply problem. Historians note several ingenious early attempts to solve this challenge. In 1809, Frederic de Driberg developed a device he called Le Triton. Operated by the continuous nodding of the divers head, Le Triton consisted of a pyramid shaped storage tank worn on the diver's back.



MADE

By Jim Hall

The diver wore a crown that was connected by a complicated set of straps and braces to a bellows in the tank which pumped air down through hoses from the surface. The deeper you dived, or the harder you worked, the faster you had to nod. Early divers had to have the neck muscles of a woodpecker to operate this unit. History does not record how many dives were made with Drieberg's

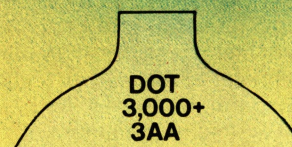
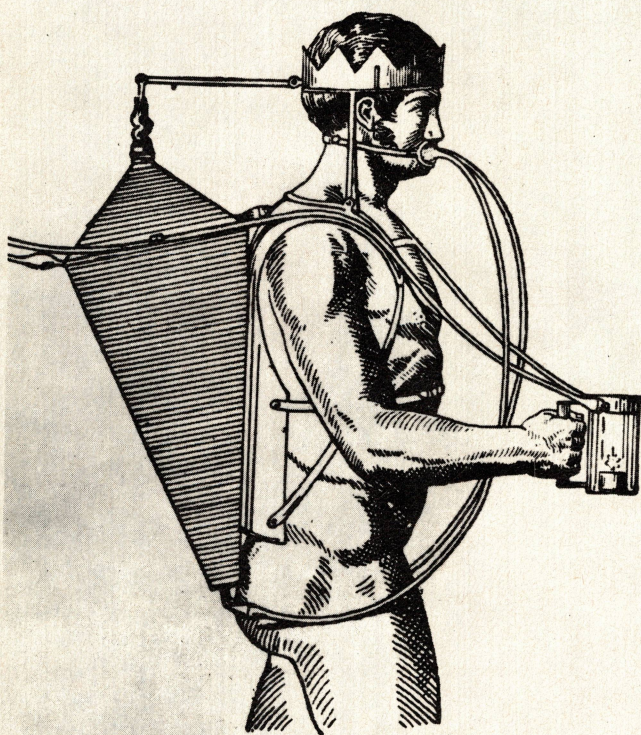


illustration by Mark Taylor

invention or whether or not any divers survived them.

In 1868, two Frenchmen — a mining engineer named Benoit Rouquayrol and a naval officer named Auguste Denayrouze — patented an apparatus they called the Aerophore. Their device consisted of a demand regulator and a tank (really no more than a canister) capable of holding compressed air at pressures of up to 600 psi. When the Aerophore was successfully demonstrated before the French Academy of Sciences it caught the attention and imagination of one of the young members. That young man was Jules Verne and two years later, in 1870, he published *20,000 Leagues Under the Sea* and popularized Rouquayrol's machine.

Shortly after Jules Verne's novel was published, a corporation was formed to make a buck with it sponge diving in Greece. Who knows what happened? Perhaps the Greek divers, trained from childhood to hold their breaths while harvesting began to die from air embolism while using the French diving apparatus. Whatever the cause, one night the divers who resented being mechanized revolted and destroyed most of the Aerophore units. Badly stung by consumer reaction, the Aerophore and its proponents faded into obscurity.



Although the Aerophore failed to capture the fancy of the divers of the day, the dream of man exploring the world beneath the sea persisted. Because of research into submarine warfare prior to and during World War I, tanks capable of holding higher pressures (and the compressors to fill them) were developed. In 1943, Gagnan and Cousteau redesigned and perfected Rouquayrol's demand regulator and added a piece of contemporary technology — a high pressure cylinder with a modified valve. Under the noses of the Italian occupation troops, modern scuba diving was born.

Today, thanks to the sciences of metallurgy and hydraulics, that hunk of metal we take for granted is virtually indestructible. In technical terms a scuba cylinder is a seamless, weldless, ellipsoidal bottomed high pressure storage vessel. Whether it is steel or aluminum, it's made to be as tough and corrosion free as possible.

What we call steel and aluminum tanks are really complex alloys blended to balance maximum strength with malleability. Steel tanks are made from A151-4130 alloy. This is a combination of carbon, manganese, magnesium, phosphorus,

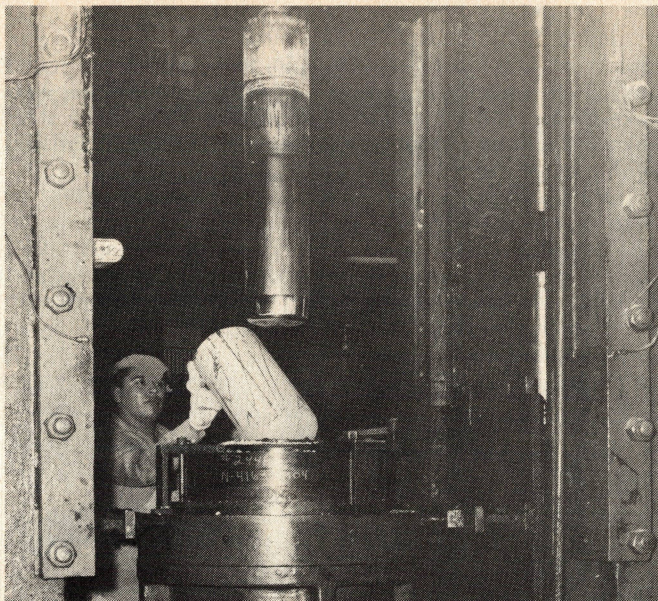


sulfur, silicon, chrome, molybdenum and iron. Early scuba cylinders are stamped with the initials 3A before the pressure ratings. These are relatively thick walled tanks and as diving grew in popularity, it became necessary to develop a tank that was lighter in weight, but still had the corrosion resistance of a 3A alloy. The 3A alloy had found wide use in carbon dioxide containers because its thick walls delayed the action of carbonic acid which sometimes formed inside. The newly developed 3AA alloy enabled the tank manufacturers to build a thinner walled cylinder with acceptable corrosion characteristics. However, because of the thinner walls, it is mandatory that a visual inspection be made every year.

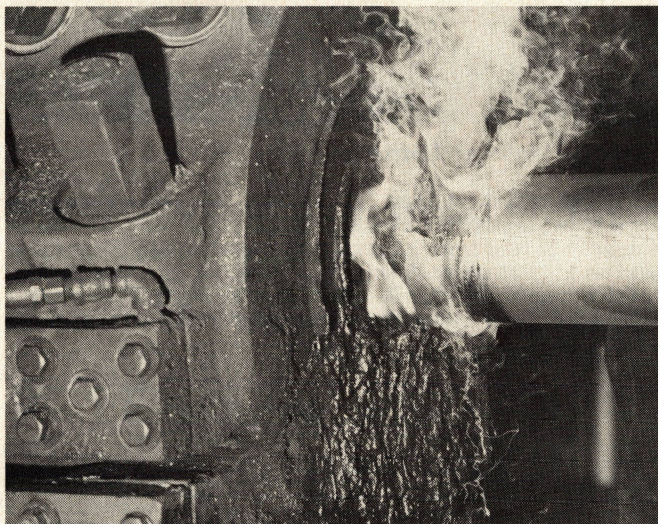
Aluminum tanks are blended from an equally sophisticated alloy. Known as 6351-T6, this alloy consists of magnesium for increased tensile strength, corrosion resistance and hardness; manganese which further increases the strength and corrosion resistance; and silicon which lowers the melting point, improves castability and when combined with magnesium yields an alloy with good formability and superior (when compared to steel) corrosion resistance. Additional metals present in the 6351 aluminum alloy are: iron, copper, zinc and titanium. Other than a quick rinse after each day of diving, a hydrostatic test every five years and an annual internal corrosion inspection (or more often if you are smart) your tanks require virtually little maintenance.

First produced commercially in the late 1930's, aluminum cylinders have developed steadily. Corrosion resistance and weight are not the only things today's aluminum tank has over the traditional steel bottle. The 6351 alloy gives us a tank that is so rugged that it can be hydroed every day for 68 years. In normal usage, that means the lifetime guarantee on that tank you bought is good for 273 years or 99,645 airfills.

Before aluminum tanks could be offered to the diving public they were rigorously tested. This testing was done in late 1971, just prior to the introduction of the aluminum dive cylinder by



Pictured above is one of the 400 ton hydraulic presses that "draw" the steel or aluminum into the shape of a cylinder.



Heated to temperature, the cylinder is then placed in a Westin Head Form Machine that rolls and presses the lip into the neck.

U.S. Divers Co. To earn the approval of the Department of Transportation, aluminum tanks had to exceed 3AA steel tanks in the following special tests:

- 1) All stock from which the cylinders are fabricated must be ultrasonically tested to assure uniform quality of materials.
- 2) The thickness of the cylinder base must be greater than 1.3 times the minimum wall thickness.
- 3) The basic design was tested with 100,000 pressure reversal cycles (filled and emptied) without any failure.
- 4) The interior configuration must have a specially designed base to eliminate any potential stress concentrations.

ALUMINUM TANK MANUFACTURE

An aluminum tank first arrives at the factory as an ultrasonically tested 100 inch long metal log. Weighing over 400 lbs. and 7.50 inches in diameter, this log, or DC ingot, is immediately subjected to a metallurgical analysis of its chemical properties and assigned a batch number. The next process is

machining the logs into smaller ingots 7.25 inches in diameter and 8.75 inches thick.

After machining, the shortened version of your scuba cylinder is lubricated with Bonderite and Bonderlube, two phosphate compounds which will keep the metal from tearing during the tremendous forces exerted during the cold extrusion process that will give it a cylindrical shape. If you can imagine filling a small cup with putty and then inserting a rod into the middle, as the putty rises in the cup you can get some idea of how the cold extrusion process works. The cylinder now is trimmed to conform to the correct dimensions for its intended storage capacity.

The aluminum cylinder is then removed from the die and cleaned of all traces of lubricant by a special etching process. At this time it is coated inside and out with Alrok, a compound that seals the etched metal and improves its corrosion resistance as well as prepares the surface for paint adhesion.

After trimming, etching and coating, your tank is ready to be necked. It is heated above 500 degrees by a flame for proper annealing and then swaged by a hydraulic ram to the configuration of the completed cylinder. A hole is drilled in the neck, which has been compressed into a star shape, and it is then faced and prepared for the crucial heat treating process by cleaning the inside with steam to remove all contaminants.

The next step is the heart of the Luxfor process. Your cylinder is heated to a temperature (that remains a company secret) for an undisclosed length of time, and then removed and quenched in water. At this point something strange begins to happen to the 6351 aluminum alloy. As it sits, it begins to get stronger and stronger. To hasten this unusual process it is baked in a special oven for less than a day until it reaches the proper strength to qualify it to become a dive cylinder. At this step, one out of every 200 tanks are sampled for tensile strength and impact resistance.

Three more rapid steps and your aluminum cylinder is ready to take diving. First, the neck is re-bored and tapped, then the tank is again steam cleaned to remove all traces of machine oil used in the threading process. It is then hydroed, coded and given a visual inspection. Polyurethane paint is applied and the tank is given its final visual inspection.

STEEL TANK MANUFACTURE

Steel tanks begin their lives not as a blob of molten metal to be molded into the proper shape, but as ten ton rolls of steel. After arriving at the factory, these rolls are cut into 5 x 10 foot sheets and placed in an enormous, 3,000,000 BTU spheroidal annealing furnace and cooked at 1300 degrees for five days. This heating rearranges the steel molecules into uniform groups which results in the steel's becoming soft and workable. That is, "soft" in respect to the unannealed metal.

After annealing, the steel is carefully cooled and sheared into strips as it is fed into a punch press and converted into disks or "cookies" 23¼ inches in diameter and one quarter inch thick. Samples are taken during this process and analyzed for the correct metallurgical composition and proper heat treating. Each production run is then assigned a batch number which will be cross matched with the tanks' serial numbers.

If the tank has passed the first of several quality control tests it is now ready for the complex series of operations that will transform it into a cylinder. Conveyed to a 400 ton hydraulic press, the "cookie" is first pressed into a large cup. The presses that shape your cylinder are marvels of technology in themselves. Costing \$1.5 million dollars apiece, these huge machines exert so much force while "drawing" the steel or aluminum of your cylinder that they must be anchored in holes that alone cost upward of \$85,000!

After the cupping process, the fledgling tank is moved to another press for the first draw. A hydraulic ram pushes the cup through a die that narrows and elongates it. At this stage the metal has undergone molecular changes and becomes

"work hardened." Less malleable than before, the cylinder is transported into another annealing furnace to make it workable again. Without this treatment, the steel would shatter under the tremendous pressures of the presses.

The neckless cylinder that comes out of the second annealing furnace is filthy. Covered with scale and oxidized lubricant, the tank is submerged in a de-scaling acid bath and rinsed before it is re-coated ("soaped") with a special lubricant to reduce the friction during subsequent draws.

Next, the tank is placed in a press for the final draw. The result is a perfect, but neckless, cylinder.

For purposes of shaping, this is the first time direct heat is used on your tank. It is placed in a Tacco oven and baked until it is cherry red and then removed and placed in a Westin Head Form Machine. The lip is maintained at that temperature as the Westin rolls and presses the lip into the neck.

Flogged and de-tempered, the battered cylinder is again placed into a special oven and heated to 1650 degrees. At the proper time, the tank is removed and quenched in an oil bath. Moving down the assembly line, another machine faces, drills and taps the neck to accept the standard $\frac{3}{4}$ inch valve of the scuba industry. Loaded onto a conveyor belt, the scaly and crusted tank is placed into a machine called a Wheelabrator and blasted with steel shot for one minute before emerging as a bright, shiny and recognizable scuba tank. What started out as a flat disk has now become 25 inches long with an outside diameter of 6 13/16 inches and a wall thickness of .156 inches.

At this stage, federal regulations require that each tank be assigned a serial number and coded as to the manufacturer and type of metal used. This is done automatically by a special machine, not unlike a super typewriter. The information that is imprinted on each tank follows a uniform system.

TANK CODES

STAMP	METAL	MEANING
DOT or ICC	ALL	Government regulatory agency. Initials stand for Department of Transportation and Interstate Commerce Commission.
1800, 2250, 3000	ALL	Pressure rating of cylinder. + mark after this number means that the tank may be overfilled by 10% of the rated pressure.
3AA	Steel	This cylinder is made of 4130 chrome-molybdenum steel alloy. Older steel tanks stamped with 3A are made from a different alloy and weigh more because they have thicker walls.
SP 6498	Aluminum	This code designates an aluminum tank made of an alloy called 6351-T6. The "SP" stands for Special Permit which the Luxfer process has been assigned by the Federal Government. The "T6" initials on the alloy number means that the tank has been heat treated for durability. The number is assigned to a particular company.

Other numbers on the neck of every cylinder, which will vary according to each tank, are the tank's personal serial number (you should keep a record of this), the initials requested by the dive equipment manufacturer, the date of the first hydro test, the tank manufacturer's symbol and the stamp of the independent testing service that examined the cylinder.

After cooling, the tank is hydrotested to 5/3 of its working pressure. This testing (as is all tests performed during the manufacturing process) is done by an objective third party testing service employed by the tank manufacturer. Very few of the 100,000 cylinders annually made for scuba diving fail this test. After hydro, the tank is cleaned of any scale or slag by steam cleaning and hot air drying. A quick visual inspection is made and a plug is put in the neck.

Each dive company puts its own finishing touches on the

tank. Galvanizing (a factory option), paint, epoxy, neat stickers and a shiny chrome valve. But despite the myriad of equipment manufacturers who put their names on scuba tanks, there are only four companies in the United States who make them: Norris Industries (who make 65% of the steel tanks and will be introducing an aluminum model); Pressed Steel, Inc.; Marison Industries and Luxfer U.S.A., Ltd.

Next time you are grunting your way down "cardiac hill" to get to your favorite dive site, or your tanks clunk noisily in the trunk of your car to the terror of your non-diving friends, take a moment to reflect on the billions of dollars of technology and the million dollars of tooling it takes to make the most humble part of your dive gear. After all, you wouldn't be able to go diving without it.



Technical Characteristics of Scuba Cylinders*:

The storage capacity of scuba cylinders have been rounded off by the manufacturers to simplify marketing. In actuality, a standard 72 steel tank contains 71.55 cubic feet of air when filled to legal capacity. Similarly, an aluminum 50 tank contains 50.44 cu. ft., an aluminum 72 contains 72.40 cu. ft., and the popular aluminum 80 contains 79.87 cubic feet of air when completely filled. The following chart was computed using the actual volume of the cylinders:

SCUBA TANK CAPACITY AT VARIOUS PRESSURES (measured in cubic feet)

	1800 psi	2250 psi	2475 psi	3000 psi
71.2 steel	52.04	65.05	71.55	N/A
Alum. 50	30.26	37.83	41.61	50.44
Alum. 71.2	43.44	54.30	59.73	72.40
Alum. 80	47.92	59.9	65.89	79.87

*The author wishes to express his thanks for the good computations and patience of Grady Fort, Manager of Marketing Administrations, U.S. Divers Co. for helping compile engineering data used in this article.

DIMENSION, WEIGHT AND BUOYANCY CHARACTERISTICS OF SCUBA CYLINDERS*

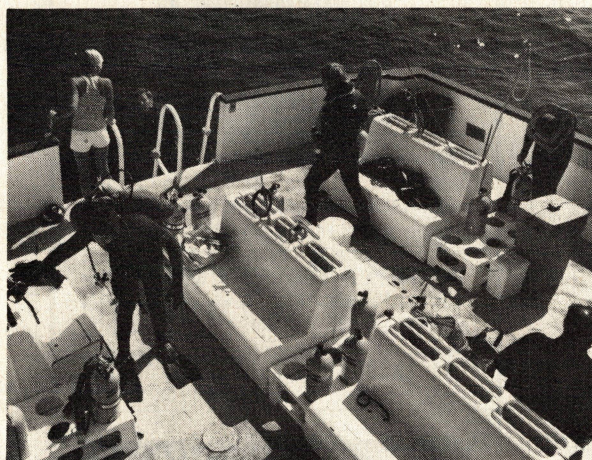
	Dimensions in inches		Weight* in Lbs.		Buoyancy in Lbs.		Wt. of airfill in Lbs.
	length	diameter	empty	full	empty	full	
Steel 71.2	27.6	6.812	29.55	34.92	Neutral	5.37—	5.37
Alum. 50	21.8	6.9	24.05	27.83	0.20+	3.58—	3.78
Alum. 71.2	28.8	6.9	31.35	36.78	2.4 +	3.03—	5.43
Alum. 80	28.6	7.25	33.05	39.04	3.80+	2.19—	5.99

*In salt water, with valve where applicable.



Truly a "Superboat," Spirit of Adventure was designed to be a luxury boat for divers. Impressive staterooms, fine gourmet meals are only a few of the luxuries offered.

The Spirit Of Adventure



Captain Bob Trask and Dan Walsh truly have the spirit of adventure as they take the boat to great dive spots for the divers. A lot of deck space and a large swim step make diving easy.



photography by Joel Nussbaum

Pacific Sport Diving Company has christened their new, million dollar vessel the *Spirit of Adventure*. This luxurious, 86-foot boat was designed from the keel up to be a super commercial sport diving cruiser. She boasts sleeping facilities for 41 passengers in an impressive array of air conditioned staterooms. Her handsome teak dining room and custom stainless steel galley are the setting for gourmet meals as well as evening entertainment. This "superboat", as it has been aptly called, has four fill stations; five outdoor, warm, freshwater showers; a convenient, submerged stern platform, or swim step, for easy exit from the water; and deck space galore. Weight belts are furnished to divers as are tanks from the boat's ample supply of U.S. Divers aluminum 80's. There is also an inflatable boat, a runabout and a small day sailer for those non-divers on board or for an afternoon off from diving.

The *Spirit of Adventure* has two ports of call: it can be found at Kailua, Kona, Hawaii, its main base of operations, every Saturday the year round; its mid-week stop is Lahaina, Maui. Because of these dual locations, trips can vary in length from three, to seven, to ten or fourteen days.

A full week, seven day trip, takes those on board to visit six islands — two of them uninhabited. Divers will visit the lava tubes off the Kona Coast, Hawaii, the underwater cathedrals off Lanai, the pristine waters of Maui, an extinct volcano underwater off Molokini, the spectacular walls of Kahoolawe, and the little rich waters of Molokai.

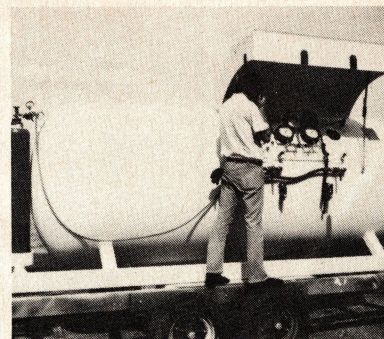
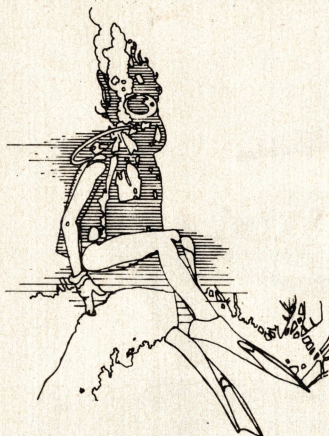
A typical week long trip (seven days) on the *Spirit of Adventure* in Hawaii, including private cabin (minimum double occupancy), all you can eat, complimentary wine and entertainment, costs \$595. The price includes transportation to and from the airport.

The first dive trip the *Spirit of Adventure* is making in Hawaii is on Saturday, January 1, 1977. Make your reservations, now — the *Spirit of Adventure's* shakedown cruises in Southern California were very popular. Pacific Sport Diving Company can be reached at: 4101 East Anaheim Street, Long Beach, California 90804. Telephone: (213) 433-7485. Bookings can also be made direct through them or reservations can be made through your local travel agent or dive shop, or See & Sea Travel Service in San Francisco.



Travelers Adaptable Bags, TABs, are lightweight, rugged, and durable bags to carry your dive gear. These handsome bags are made of colorful, parapac nylon fabric, 2" nylon web, and a heavy Talon zipper. They feature a mesh vent to allow wet gear to dry and prevent mildew. They are priced from \$9.50 to \$20. Available from TABs, 2111 South Grand Ave., Santa Ana, Calif. 92705.

New Gear

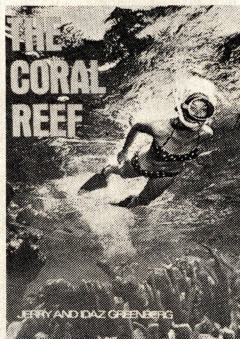


The Divers Double Lock Decompression Chamber is rated to 325 feet by ASME and the USCG. It can be converted to a small hyperbaric facility and comes with gauges, breathing masks, 3 station sound powered phones, O₂ system, bunk, and hyperbaric lights. Other options are available. Priced from \$12,950, it is from Perry Oceanographics, Inc., P.O. Box 10297, Riviera Beach, Fla. 33404.



AGA has four new Bail-Out Backpack units available to accommodate single or twin cylinders. Each unit consists of one or two cylinders, regulator assembly and harness assembly that features a locking device for easy and quick attachment of the cylinder to the frame. The units are priced from \$239. AGA Corp., Divator Division, 1163 Chess Dr., Foster City, California 94404.

The Coral Reef by Jerry and Idaz Greenberg is a pictorial essay depicting the corals and fishes of Florida, the Bahamas, Bermuda, and the Caribbean. This 65 page, paperback book has 52 beautiful color photographs with a comprehensive text. Priced at \$3.95, this book is published by and is available from Seahawk Press, 6840 Southwest 92nd Street, Miami, Florida 33156

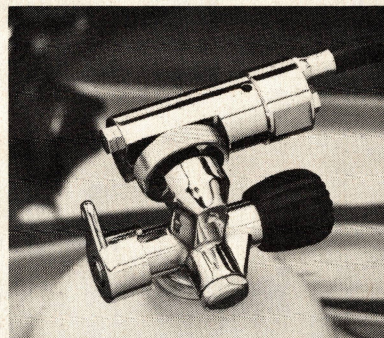
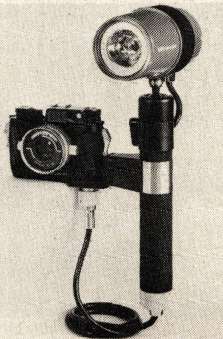


The Hamilton Aqua Marine dive watch features a 17 jewel, self-winding movement with a protected crown. It has a distinctive bezel that is half black and half red. The case is made of stainless steel and the dial is luminous with a quick change day and date. This watch is priced at \$99 and is available from Aquatic Research Engineering, Inc., P.O. Box 364, Medford, New Jersey 08055.

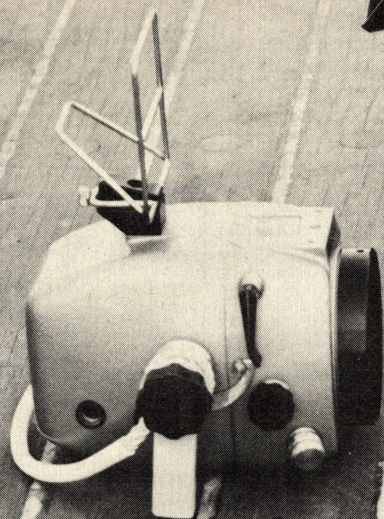


The Seaboard Ocean Kayak will get you to those hard to reach coves and reefs. With a scuba tank well in the rear and a 5' 10" storage compartment in the front, the kayak is capable of storing 2-3 tanks and full gear. It measures 14' by 24" and is designed for maximum speed and good tracking. It is priced at \$275 from Seaboard Products, P.O. Box 4275, Malibu, California 90265.

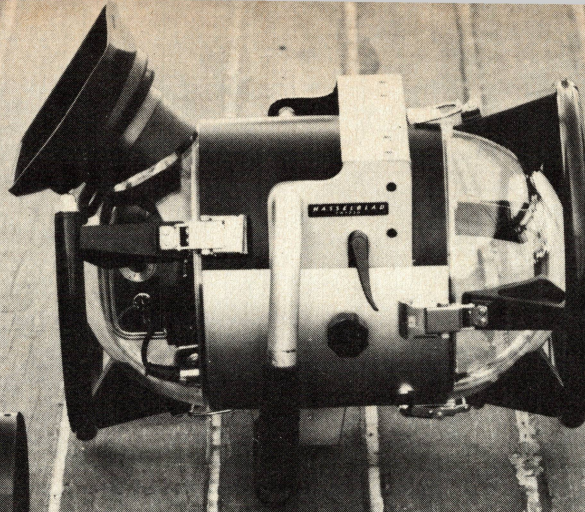
Sunpak Marine 24 electronic flash is powered by a quick charge nicad insert, which provides approximately 80 flashes, recharging fully in three hours. A rotary calculator dial shows exposure information for both land and water use. This unit sells for \$280 and is available from the Sunpak Division, Berkey Marketing Companies, Incorporated, P.O. Box 1060, Woodside, New York 11377.



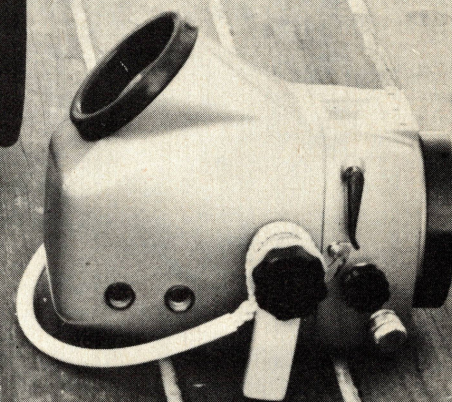
The 5000 psi working pressure, regulator to valve connection, C.S.S. System, that has been used in Europe for many years has come to the U.S.A. The valve may be used with systems up to 5000 psi and with a small fitting in the valve, it may be adapted to use with systems under 3000 psi. The valve sells for \$41 and the regulator for \$116. U.S. Cavalero, 3186 Airway Ave., Costa Mesa, Calif.



Hasselblad Underwater Housing
SWC



Hasselblad Underwater Housing
500EL/M



Hasselblad Underwater Housing
500C/M

Manual film winding and shutter cocking now a thing of the past in underwater photography!

An underwater housing for the motorized $2\frac{1}{4} \times 2\frac{1}{4}$ Hasselblad 500EL/M is currently undergoing pre-production tests in Scandinavian waters. This new underwater housing should be available for delivery in December 1976.

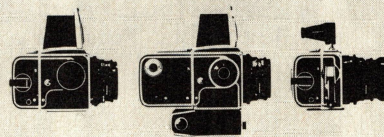
Motorized operation has a lot going for it in underwater photography. The photographer is able to devote all his attention to his subjects, even fast-moving ones, and can fire off exposures without ever removing his eye from the viewfinder. The camera motor automatically advances the film and cocks the shutter right after each exposure.

The camera is locked into the housing with a quick-coupling. Housing controls then hitch onto the camera controls automatically.

The two interchangeable domes at the front and rear of the housing are attached quickly and simply. These domes enable you to obtain the best optical results. Heavy-duty grip rings protect the domes and, used in conjunction with the handgrips, make it easy to carry the camera on land and in water. Illuminated scales facilitate fast and accurate aperture and shutter speed settings.

The exposure release and controls are designed for easy use even when operated by a diver wearing gloves. In addition to the standard 12-exposure magazine, the single-lens reflex Hasselblad 500EL/M can also be used with magazines holding 16, 24 or 70 exposures. The Magazine 70 holds enough film for 70 exposures a dive. And changing magazines is literally a snap.

So there is a host of exciting new opportunities for innovative underwater photography for you now that all the Hasselblad cameras can be used beneath the waves.



H A S S E L B L A D

Victor Hasselblad Aktiebolag.
Box 220, S-401 23 Göteborg, Sweden.

Please send information to
Name:
Address:
City:
Country:

The Blue Chromis

(*Chromis cyanea*)

The blue chromis is the dazzling sapphire of Caribbean reefs. Its deep ultramarine body, rimmed with black, sets it apart from the small fishes it swims with; these include several species of wrasses and its brother, the brown chromis. The chromis species belongs to the Pomacentridae family of damselfishes, a group not only noted for the colorful costumes of its members, but also for colorful personalities. Damselfishes are notoriously territorial, attacking anything that swims over predetermined boundaries. During the mating season this aggressiveness and pugnacity is nearly fierce. The male guards the eggs which have been laid by the female, and swims constantly and nervously back and forth over them, protecting them from predators who would eat them in short order. If a predatory fish comes too close, the damsel will make a quick and furious rush at the intruder and drive it

away. Even divers who venture too close will be nipped by the energetic little guardian that seems to care less about the size of what it attacks. □ The chromis species is distinguished from the rest of the Pomacentrid family by having more elongate bodies and deeply forked tails. The two common species found in the Caribbean, *Chromis cyanea* (blue chromis) and *C. multilineata* (brown chromis) often swim together and can be separated, obviously, by their colors. The blue chromis appears to feed only on zooplankton, whereas other damselfishes are omnivorous. Ichthyologist John Randall did a study of blue chromis feeding habits and observed that they rise well above the reefs, usually in loose groups, facing the current and

picking up passing plankton from the water mass. Copepods comprise half their diet, followed by tunicates, shrimp larvae and fish eggs. At the first hint of danger, they will descend into the cracks and crevices of the reef. □ The bright, iridescent blue color of the fish has been known to vary according to the immediate environment in which it is swimming. Randall has noticed that the deep blue color will fade into a dull greyish blue as the fish reaches the shelter of a reef, which leads him to believe that the coloration is possibly a camouflage device. When seen in offshore locations,

where the water is deep blue, the fish takes on its brilliant deep shade. Ichthyologists James Bohlke and Charles Chaplin have observed some turquoise individuals. In any case, the color is the basis for both the common and scientific name of the fish. Warren Zeiller, curator of the Miami Seaquarium, tells us that

chromis is an ancient name for fish, and that *cyanea* means blue in both Greek and Latin. There is also a prominent black margin which spreads along the spinous dorsal fin and on the upper and lower lobes of the tail. □ The blue chromis is a common fish and divers can get it to swim closer by opening sea urchins underwater. The first takers of the handout will usually be the ever present wrasses, but very often the accompanying blue chromis will come in for at least a look. This fish is most abundant on open and patch reefs between 35 and 70 feet. Bohlke and Chaplin have recorded the blue chromis from 10 to 180 feet, throughout the Bahamas and Florida, ranging south through the Lesser Antilles. 🐟

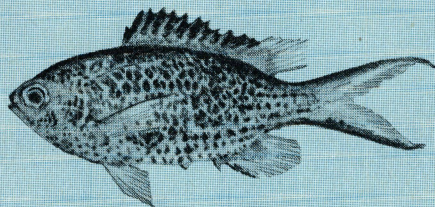
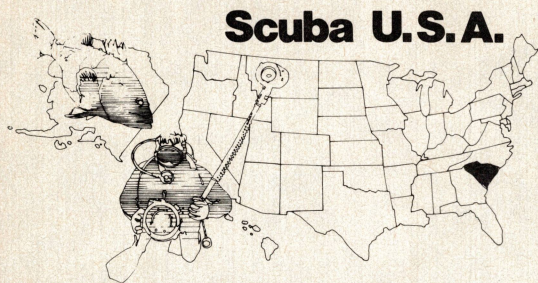


Photo By Carl Roessler—Text By Hillary Hauser

The photo was taken in 30 feet of water off Grand Cayman Island. Roessler used a Nikon F camera with a 55mm lens and a Bauer strobe, Kodachrome 25, 1/60 second at f11, 12 inches from the subject.





South Carolina's LIVING REEFS

By Mike and Ann Adair

Good diving off Charleston? You've got to be kidding! I've been in that water and you can't see your hand in front of your face! That's the usual comment we hear when my husband and I tell fellow divers about the many exciting hours we have spent under South Carolina's coastal waters.

The turbid inshore water at South Carolina is caused by natural forces, not pollution. Numerous upstate rivers flow into the coastal waters, depositing rich dark topsoil. Also much of the coast is surrounded by mud based tidal marshland which provides valuable nurseries for many species of water-fowl, commercial and game fish. The thick black mud mingles with the water during the five foot tidal drop and causes the zero visibility near land. Not far offshore, conditions improve. The sand covered bottom begins to cleanse the waters, and eight miles out, the 40 foot depth has obtained a clarity that varies from 15 to 50 feet. Not exactly Cayman or Cozumel, but very pleasant and interesting diving, indeed. The continental shelf in this area slopes gradually seaward for more than 70 miles before meeting the fabled Gulf Stream. The sand bottom could be compared to a desert.

Where then, one might ask, can good diving be found in these barren waters? Eight years ago a federal/state project was established to create a chain of artificial fishing reefs which now, on a coastal chart, dot the eastern coast of the United States from the far north well into southern Florida. The dump sites have created an "oasis in the desert."

The reefs were primarily conceived for the fisherman, but the locations have also become meccas for South Carolina scuba divers. Located roughly ten miles offshore, the sites are buoyed and charted for easy identification.

Reef material varies, but the most successful items have been derelict ships and discarded tire casings. The ships are donated from several sources, stripped, cleaned and sunk on designated reef sites. The old tire casings create a serious disposal problem topside, but when deposited on reef sites to create fish habitats, they become an asset rather than a liability. The tires are compressed into bales (seven to ten at a time), and dumped from barges onto the sites. The rubber houses are an immediate smash hit among the underwater population. Numerous species flock to the dump areas like desert travelers to an oasis, for the reefs supply their dwellers with excellent protection in their "fish eat fish world."

Each reef varies in size and profile, but they average one quarter square mile and rise up 10 to 20 feet above the sandy bottom. The derelict ships are piled high with tires before they are sunk and many more bales are added after the hulls are in place. Landing crafts, mine sweepers and abandon dry docks are the primary carcasses used for the Charleston reefs. Old cars were first used but they proved too difficult and costly to clean and prepare for the watery resting places. Months of

hauling and dumping goes into the establishment of a primary artificial reef, as thousands and thousands of tires are deposited on a reef site.

Two major reef areas lay off the Charleston coast. One, referred to as the Capers Island Reef, or R8, is accessible from Charleston's main harbor and lies ten miles off an 85 degree course from the Charleston jetties in the vicinity of the R8 buoy. The second is easily reached by launching your boat at Cherry Point landing on Wadmalaw Island, 19 miles south of the city, and then running a course of 105 degrees from the safe North Edisto Inlet sea buoy. It takes about an hour in a fairly swift runabout to reach either of the reef areas, but the journey is very rewarding.

The R8 Reef is made up of three major sections, each started with a vessel carcass (the Casson, the Landing Craft, and the Trawler) for the inner core of the area and separate buoys have been placed on each for easy identification. The Casson is noted for its abundance of hiding flounder; the Landing Craft has a dense growth of colorful soft coral growing on its open bow door; and the Trawler has its picturesque toilet still intact which makes a perfect spot for portraits.

The Kiawah Island or 4KI reef is comprised of several pieces, but the seagoing tug, *The Hinton*, forms one of the major attractions at the sight. The remains of the 80 foot vessel has the galley and cabin partially intact and makes a dive for the classic wreck fans. Thousands of tires expand the reef far past the basic hull and the bashful octopus can often be found nestled near the craft's fallen smokestack.

On a typical dive one might descend the anchor line and settle on the sandy bottom. The trip down is often a pleasant one, as graceful 12 inch spadefish usually escort you on your journey below. Nearby the reef rises up like a dark mountain full of promise. If you are diving on one of the well established sections, growth of sea plants and animals has encompassed the man-made materials and the sight appears natural. Starting with the colorful soft and hard corals, the resident community includes a full roster of marine creatures.

Making your way along the reef, if you look carefully, you will see various small species (blennies, hawkfish, cardinal and pinfish) darting among the debris taking full advantage of the reef's shelter. Herds of five to ten cowlike sheep head with their striking vertical black and white striping may catch your eye. They hover lazily over the reef and their three to ten pound bodies are prize catch for the top sideangler and the spearfisherman alike. The most numerous of the reef dwellers are sea bass. From one and a half inch juveniles to foot and a half long grey bellied grandpas, the observant diver can easily spot any size desired for the photograph or the frying pan.

One might also note the odd moving trigger fish. These one to two foot flat bodied fellows move themselves about with



only a wave of their upper and lower fins, never moving their large bulky body. They may become a pest, as they enjoy swimming up to your faceplate and admire their images.

Clouds of silver sided bait fish cascade over the reef by the hundreds. They move in unison forming a wall of motion like swarming undersea bees. Being a primary food of the larger game fish, their presence on a reef means the blues, jacks and mackerel families will not be far behind.

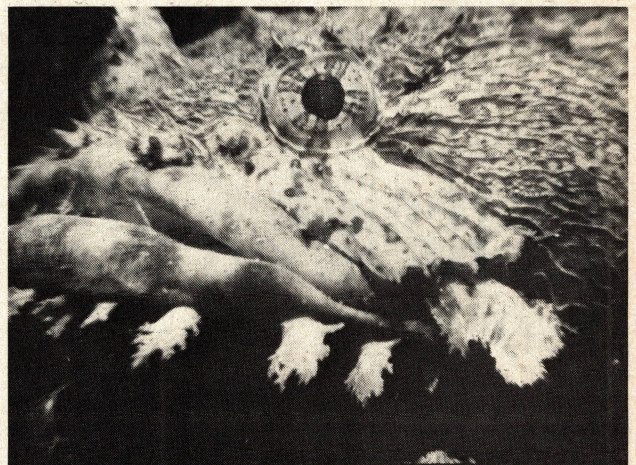
Normally the larger game fish don't stay on the reefs, but they definitely frequent the areas to search for food. Often while swimming along the timbers you will spot the strong sleek swimmers making a speedy scan of a portion of the reef. The sites are not just homes for the normal everyday creatures, as sea turtles, squid and octopus can be found taking shelter among the tires. A discovery of one of these odd reef residents is often the highlight of one's dive. Flounder abound on the reefs and the master of camouflage can often be detected hiding on the sand near the base of a section of reef.

Spearfishing is a delite on the Charleston reefs. Bass, flounder, sheephead, and spade fish are all treats for the pallet. Care should be taken by the spearfisherman, as he should only take what he needs. The virgin reefs are plentiful, but over spearing can easily destroy what so many have worked hard to create.

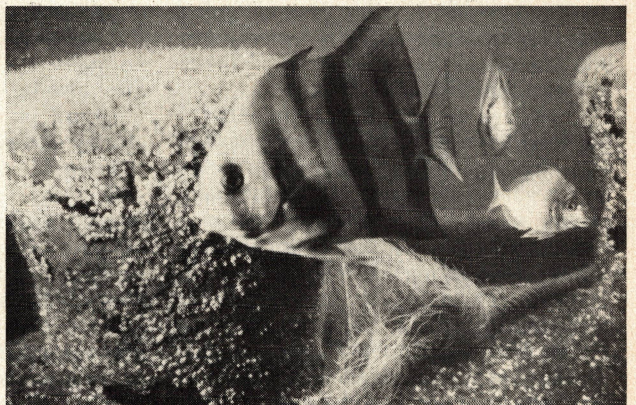
The R8 and 4KI habitats are only part of the long bountiful chain of artificial reefs on the South Carolina coast. The South Carolina Wild Life Commission Marine Resources Division in Charleston is glad to supply interested divers with brochures of the various coastal reefs, and a local dive center, The Wet Shop, offers reef trips to certified divers and are happy to supply you with equipment or information on the area.

Some avid Charleston divers enjoy the reefs year round, but the going gets a bit rough with 40 degree winter water temperatures. Summer and fall are perhaps the ideal seasons to explore the reefs. From May to October the diving is great and only a wet suit top may be desired to ward off long dive chills.

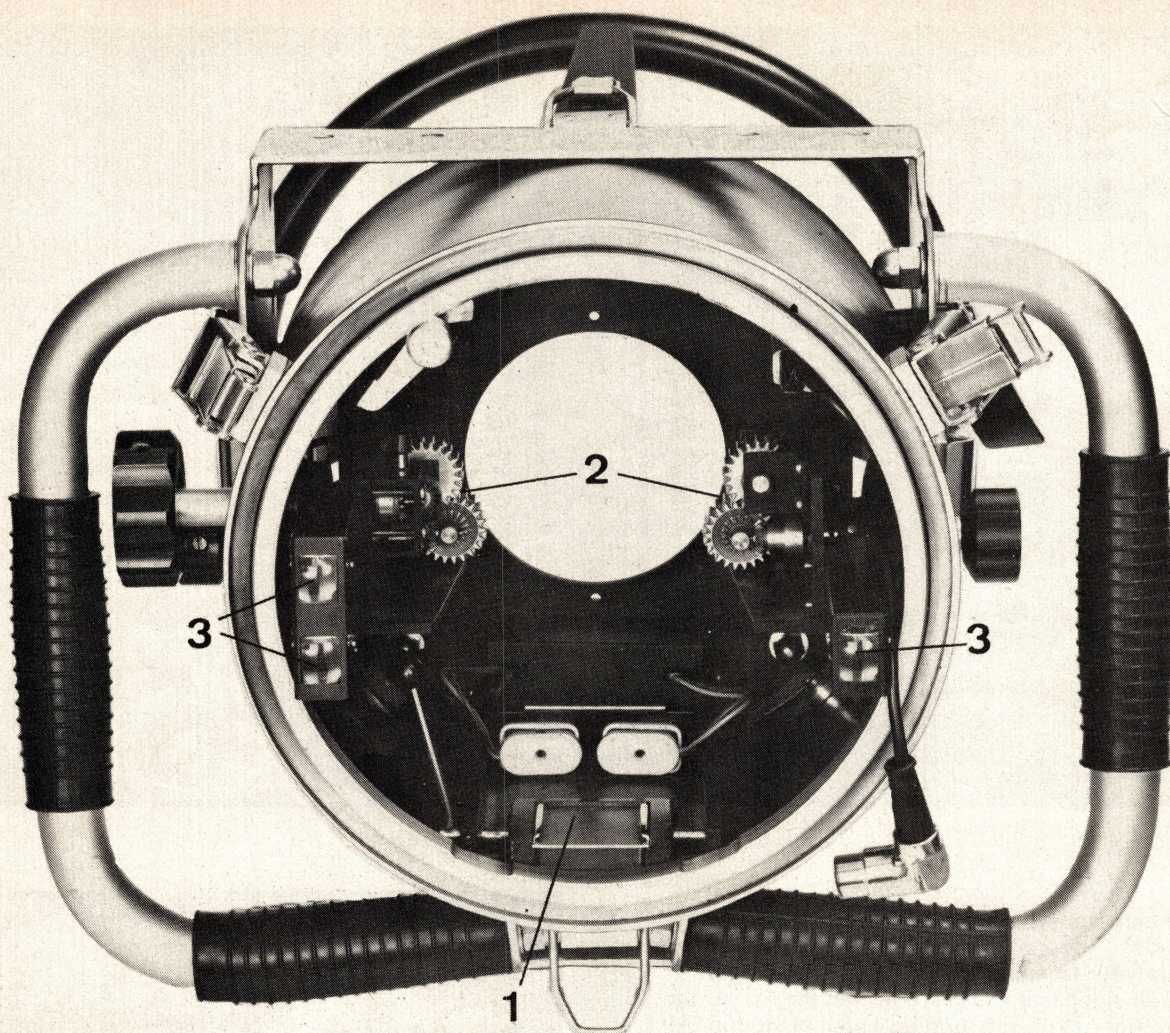
Our Charleston Reefs are not to be compared with tropical areas. But they do offer a different forest with different animals, and a different beauty — but much beauty none the less. 🐠



Derelict ships and discarded tire casings have created a chain of artificial reefs which dot the eastern coast from the far north well into southern Florida. Toadfish and spadefish are common inhabitants of these artificial reefs.



photography by Authors



Hasselblad U/W Housing for the 500EL/M

AN SDM PRODUCT REVIEW

By Odd Tommelstad

In order to meet the ever increasing demands imposed on underwater photography, the Hasselblad company began experimenting with different designs for an underwater housing for the Hasselblad 500EL/M some time ago.

Development work is now at a very advanced stage, and a prototype of the new underwater housing is undergoing final preproduction tests. This underwater housing should be available for delivery in December 1976.

An underwater housing for the 500EL/M has long been the wish of many underwater photographers. Motorized operation, regarded as indispensable by many photographers ashore, is even more of a boon underwater. Automatic film winding and shutter cocking an instant after each exposure enables you to concentrate on your subject without ever removing your eye from the viewfinder. This is a big advantage, since both the photographer and his subject are often on the move under-

water. Motorized operation also enables you to make the best use of the Magazine 70. This magazine will give you all of 70 exposures a dive before you have to surface for reloading.

Most cameras are designed for optimum performance and operation on land. So modifications have to be made when these cameras are used underwater.

Changing camera settings, which is normally a simple procedure on land, must also be simple for the photographer working in cold water and wearing clumsy gloves.

So design work has to start from the inside. Devices are designed making it possible to operate camera controls from outside the housing. The shape of the housing is not a primary consideration at this initial stage of design efforts.

Once these devices have been worked out, ways to build the housing around the camera and its controls can be considered.

One of the specifications laid down

right from the start was that the housing has to be operational even at great depths, i.e. down to about 650 feet (200 m). The housed camera also has to be easy to work with underwater, and fitting the camera into the housing on land has to be a simple operation.

Divers who have participated in the tests also have asked for heavy duty grips to facilitate holding the camera underwater and carrying it on land. Sturdy handgrips are also necessary for lifting the housing back into the boat after a dive. Optimum image quality and the possibility to use the different lenses and film magazines in the Hasselblad system have been other demands.

External design

Designers have proposed a spherical shape, since a sphere is the shape taking up the least space at a given volume, thereby providing the housing with the greatest possible resistance to pressure.

However, the idea of a perfect sphere has not proven to be feasible, and designers have opted for a modified sphere instead.

The result: a cylinder inserted between two hemispheres. This design is nearly ideal in its resistance to heavy pressure. But a sphere/cylinder is far from being the easiest shape to hold, on land or in water.

So functional handgrips have been built in. A rugged grip ring has been added in front of each dome. These grip rings are designed to protect the domes and provide steady support for the housing during transport. Other grips are located so that they yield a balanced hold on the

housing during photography. Controls for focusing, shutter speeds, aperture and shutter release have been placed near these grips, and protected by them. Illuminated scales make it easy to read the various scales.

An important principle has been to base the design of grips and controls on conditions actually encountered in underwater work. Chilly Scandinavian waters provide ideal test conditions. Constant volume wet suits with 26-33 pounds of weight are often necessary in these waters. A diver also has to work with gloves or even mittens at times.

The fact that the underwater housing is designed for use in rugged conditions is no disadvantage to photographers who can work in warmer waters. Quite the opposite! Controls designed for work with gloves are even easier to operate with ungloved hands.

Optical system

The dome has an ideal shape because of its ability to withstand pressure at great depth. But the excellent optical properties of the dome are actually the main reason for its use in the new housing. A dome

eliminates some of the problems arising when you photograph through a flat port under water. The dome does not alter the focal length of the camera's optical system. So your lenses have the same focal length and the same angle of view underwater as on land. (A flat port increases focal length and reduces the angle of view of your lens.)

A dome also provides a dramatic reduction in the chromatic aberrations which can arise in underwater photography, contributing to optimum resolution.

The optical calculations required in designing a dome for an underwater housing are extremely complicated. (Calculations for the Hasselblad EL Housing were performed by Carl Zeiss in Oberkochen.)

When used in water, a dome functions like a large negative lens. A Proxar auxiliary lens must be used on the camera lens in order to counteract this effect.

Sealing

The sealing of an underwater housing is obviously of the greatest importance. Even when used at great depth under heavy external pressure, the protective shell has to keep camera and equipment completely dry. Control lead-ins and dome sealings have been tested at depths to about 650 feet (200 m) with no leakage occurring.

Specifications

The Hasselblad EL Underwater Housing is designed for use with the Hasselblad 500EL/M and film magazines holding 12, 16, 24 or 70 exposures.

Lenses:

50mm f/4 Distagon diagonal angle of view: 75°; horizontal: 58°

60mm f/3.5 Distagon diagonal angle of view: 66°; horizontal: 50°

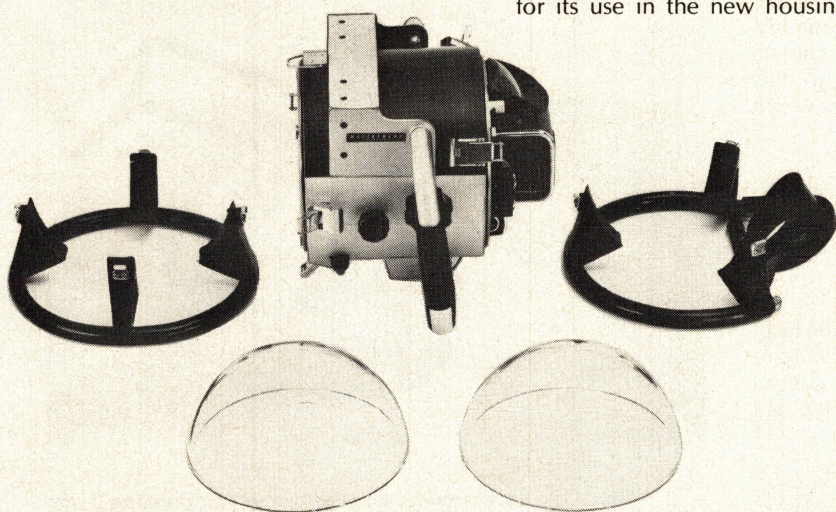
80mm f/2.8 Planar diagonal angle of view: 52°; horizontal: 38°.

The underwater housing is corrosion resistant. The housing's central section is made of acid resistant steel, 0.1 inch thick and electropolished to resist fouling. The front and rear of the housing feature identical correction domes made of 1/4 inch thick acrylic plastic, 8 inches in diameter.

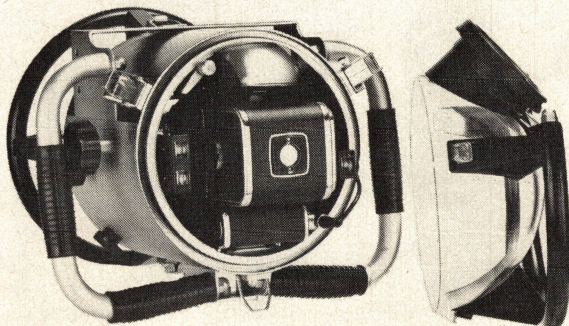
Two 9 V batteries provide the power for the illumination of focusing, shutter speed and aperture scales. A contact is provided for synchronized use of electronic or expendable flash at all shutter speeds.

Housing weight on land, including the camera, 50mm f/4 Distagon lens and a Magazine 70 is about 27½ pounds. Weight in water: 0-14 oz, depending on the choice of lens and magazine. Tested at a depth of about 650 ft (200 m). The base of the housing has a tripod socket. The top of the housing has an accessory bridge for the attachment of a flash gun, exposure meter or other items. >#

Left, the 500EL/M is locked into the housing with a quick coupling (1). Housing controls then hitch onto the camera controls automatically (2). Illuminated scales (3) facilitate fast and accurate aperture and shutter speed settings.



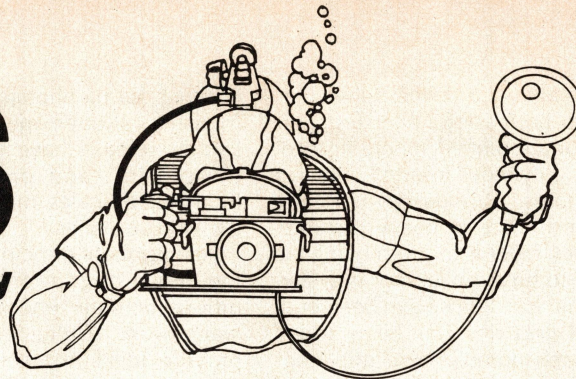
Above, the two interchangeable domes at the front and rear of the housing are attached quickly and simply. These domes enable you to obtain the best optical results. Heavy duty grip rings protect the domes and, used together with the handgrips, make it easier to carry the camera.



In addition to the standard 12 exposure magazine, the single lens reflex 500EL/M can also be used with magazines holding 16, 24 or 70 exposures. The Magazine 70 holds enough film for 70 exposures a dive. Changing mags is literally a snap.

abc's

of underwater photography



CHAPTER 11

NIKONOS EXTENSION TUBES

By Jim and Cathy Church

The purpose of this chapter is to introduce you to the use of extension tubes with your Nikonos camera.

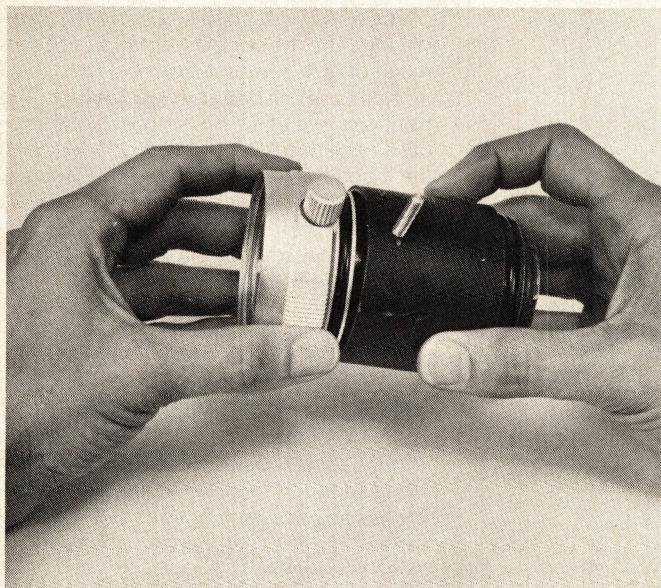
WHAT ARE EXTENSION TUBES

An extension tube is simply a metal cylinder which fits between the Nikonos camera body and the Nikonos lens assembly. Its purpose is to extend the lens further away from the camera body which decreases the focused distance of the lens to only a few inches. This allows you to photograph tiny creatures which are only three inches or less in length.

GETTING READY

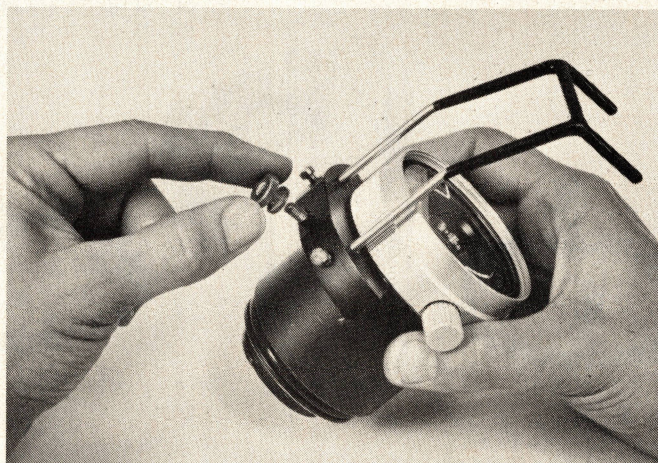
Let's begin by going through the steps necessary to fit the tube between the camera body and lens:

1. Attach the lens to the front of the extension tube. The front of the tube is machined so the lens will attach in the same manner that it attaches to a camera body. With the focus control knob pointing upward, press the lens in place and turn it a half turn to the right to lock it in place.



photography by Authors

2. Attach the focal frame to the extension tube. If you are using an Oceanic Products tube, the framer and tube are color coded so you can be sure that the correct framer is being attached to its corresponding tube. You will need a screwdriver to attach the OP framer in place. If you have a Subsea or Aqua-Craft tube the framer is held in place with a knurled brass nut.



3. Attach the extension tube to the camera by pressing it into place and rotating to the right as though the tube were a lens.





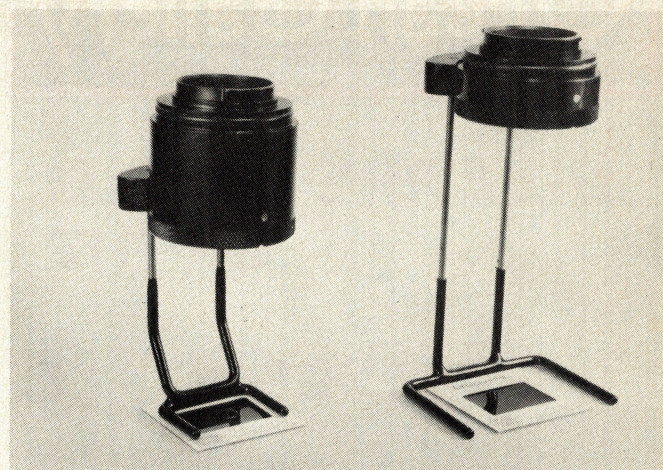
The camera body, extension tube and lens should now form a single unit. Be sure the framer, lens and camera body are in alignment. Alignment can be corrected by rotating the extension tube.

TUBES COME IN SIZES

Extension tubes come in sizes such as 1:1, 1:2 and 1:3. These numbers represent the reproduction (image/subject) ratio of the tube. The first number represents the size of the image on film, and the second number represents the subject's actual life-size. For example, with a 1:3 tube (pronounced one-to-three), if the image on film is one inch long, the subject's actual life-size would be three inches long.

To quickly estimate the size (reproduction ratio) of an extension tube, compare the width of the area within the framer to the width of the film area of a 35mm slide. Allowing for a little clearance, if the framer is as wide as the film area of the slide, it is a 1:1 tube. If the framer is twice as wide, it is a 1:2 tube; and if the framer is three times as wide, it is a 1:3 tube.

There is another size aspect to extension tubes. Most tubes and their framers are designed for use with the Nikonos 35mm lens. Therefore, if you have the 28mm lens, be sure that you purchase a tube and framer that is designed for your lens. Generally, the only difference is in the framer because the 28mm lens focuses closer and has a wider picture angle.



MORE LIGHT IS NEEDED

Whenever an extension tube is used, more light will be needed for an exposure than is indicated by the f stops on the aperture scale of the camera lens. The longer the tube, the greater the increase in light required. With a 1:1 tube, exposure must be increased by 2 stops; with a 1:2 tube, 1 1/6 stops; with a 1:3 tube, 5/6 of a stop.

In practice, all you really need to know is that you compensate by holding your strobe closer to the subject. The longer the tube, the closer you hold the strobe. If you wish a more detailed explanation, read our book, *Underwater Strobe Photography*.

EXPOSURE TESTING

Here is how you can determine the correct aperture and strobe to subject distance for your extension tube:

1. Load with ASA 64 color slide film, and preset for f22 and minimum focused distance.
2. Take test exposures with strobe to subject distances of about 4, 6, 8, 10 and 12 inches. Reset for f16 and repeat this test.
3. Project your slides and select those with the best exposures from the f22 test — note the strobe to subject distances used. If your strobe was too weak for good exposures at f22, select the best exposure from the f16 test.

PHOTO QUIZ

1. Can you photograph a larger subject area with a 1:2 extension tube than with a 1:3 extension tube?
2. Are the use of framers vitally important when you are using extension tubes?
3. If you have a 1:1 tube on your Nikonos, and see a whale having a baby, will you miss this shot?

NOTE: Neither Jim and Cathy, or SDM, can critique your work. Answers to the above: (1) no, (2) yes — depth of field is very shallow, (3) yes.

ASSIGNMENT

1. Place a snorkel tube on the bottom of a pool. Photograph the end of the snorkel with several different camera angles.
2. Examine your pictures and study the effects of camera angle and limited depth of field in your pictures.
3. Repeat this experiment with other shapes — a coin, toy car, and curved and flat surfaces with lettering. Again, study the effects of camera angle and depth of field.
4. If you can only practice in open water, apply the above to natural subjects.

BIZARRE WORLD OF THE

Text and photography by Valerie Taylor

Nudibranchs are the most bizarre and colorful of marine creatures: the shapes and patterns of these sluggish little animals seem limitless. Even the eggs of the nudibranchs are beautiful. Generally found in sheltered places, the delicate coils of pastel colored eggs are left by their parents to hatch and grow as best they may. In the larval stage the nudibranchs have a tiny shell, but this quickly disappears. The adult nudibranch's only resemblance to other molluscs appears to be their foot, which they use to crawl around the ocean floor in search of food.

A feature by which most nudibranchs can be recognized is the exposed gills or lung. The word nudibranch means naked lung, which is a very suitable name for these shell-less molluscs. Generally situated near the rear of the nudibranch's back, these lungs grow in an incredible variety of rosette like shapes. If molested, the nudibranchs retract their lungs into the safety of their body.

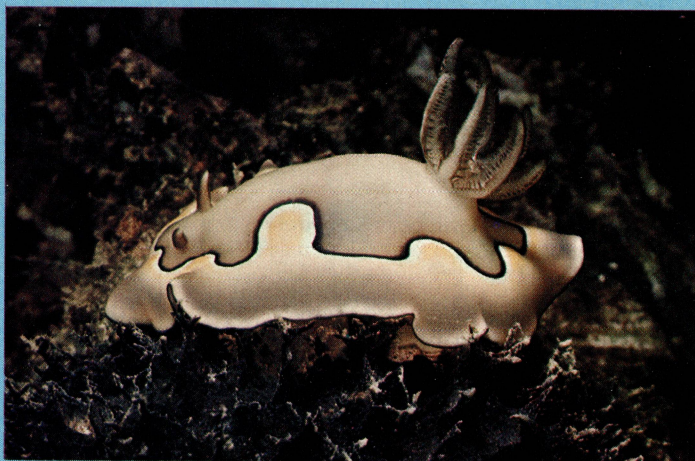
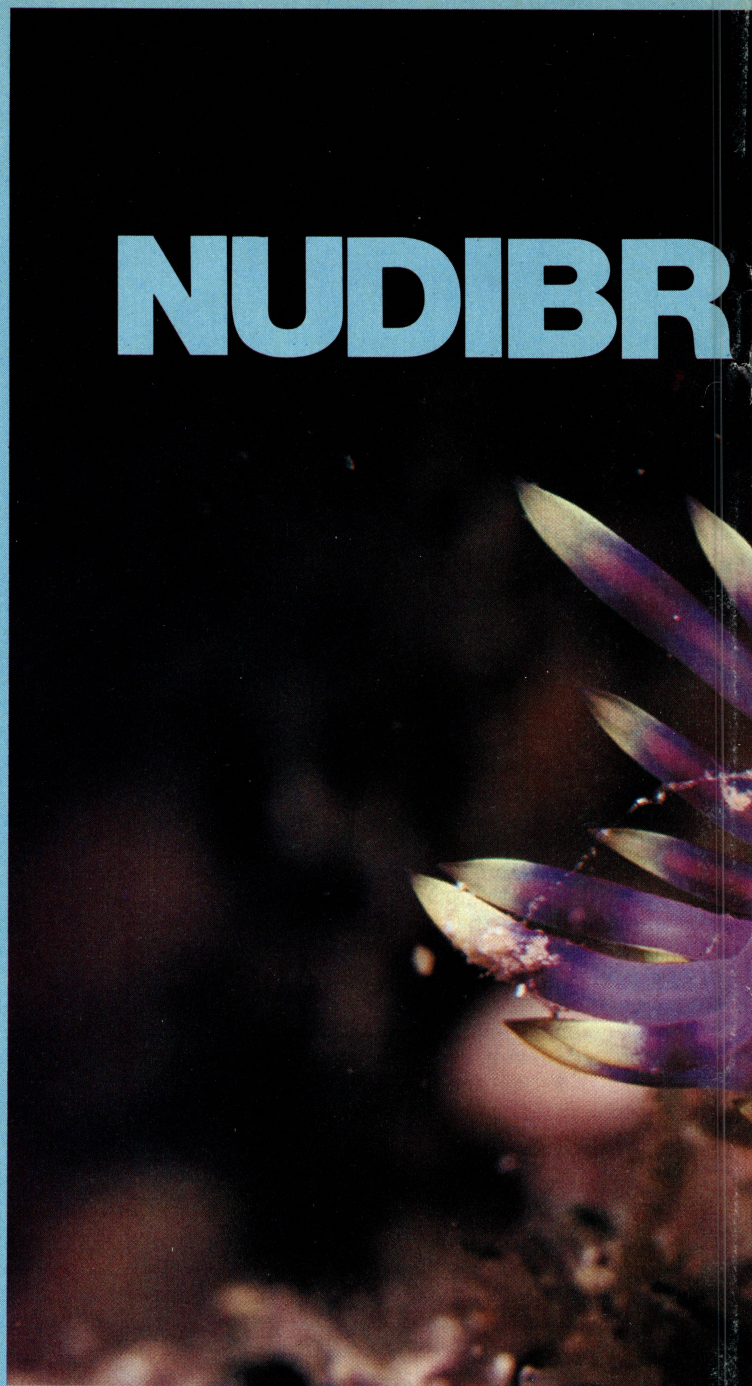
Generally, nudibranchs are very small, though I have seen several large species. One specimen in particular was dark red and must have weighed over one pound. I photographed this animal, but in spite of all my efforts the creature in the picture only looked like a big uninteresting blob. But, fortunately, not all nudibranchs look this way — most are fascinating. It would take a lifetime of study to even begin to know them all.

Although nudibranchs are found all around Australia, they seem to be most abundant on the Great Barrier Reef, off Australia's northeast coast. They can be easily discovered by the reef walker at low tide on the exposed coral reefs, hiding from the sun under dead coral branches. Being a diver, however, I have learned where to search for nudibranchs in deeper water. Some species enjoy eating sponges, but the most beautiful of all, to me, are anemone eaters. These nudibranch somehow utilize the anemone toxin for their own defense.

Several nudibranch species, if touched, spread the decorative appendages on their backs in an apparent form of defense. Several species can swim as well as crawl. The best known swimmer is the large, brilliant Spanish dancer (*Hexabranchius imperialis*). This incredible creature moves with such agility and grace it is almost hypnotic. I have used a full tank of air just drifting with a Spanish dancer as it undulated through the water.

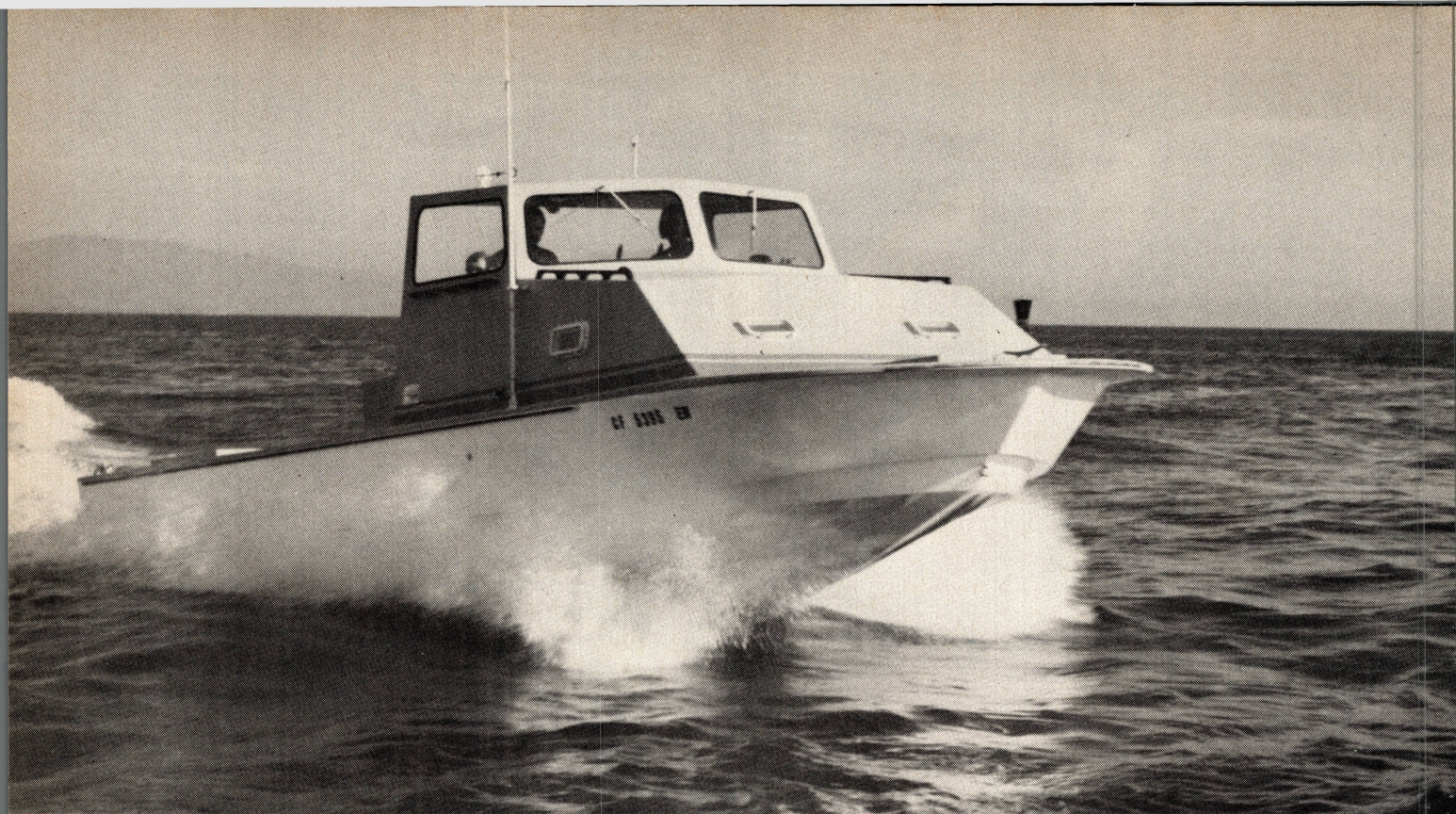
Why nature has made the nudibranchs so beautiful in shape and color I cannot even guess. The crown jewels could hardly match the beauty of these little shell-less molluscs. Some divers become nudibranch cranks. They search for, study and photograph nothing else. I can easily understand why. The thrill of finding and photographing a new nudibranch is very exciting. And seeing the perfect slide blown up several hundred times on the screen is a most satisfying reward. 🐌

NUDIBR



ANCH





Radon Boats

SDM PRODUCT REVIEW

By Jack Drake

It is 8:00 a.m. at the Santa Barbara Harbor in California. The morning fog is just beginning to lift and the many abalone and urchin divers based at this port are slipping out to sea on their way to work 20 to 60 miles away, the Santa Barbara Channel Islands.

Although these divers use many different types of personal gear such as wet suits, compressors, and hose, many of them have the same type boat, a Radon. Why this consistency?

The Santa Barbara Channel can be one of the roughest channels in the world when the proper weather breaks, producing 10 to 12 foot swells and 40 knot winds. Heavy seas can spring from a dead calm in just a matter of hours. These divers have found that a Radon is one of the best small boats around for carrying heavy loads at high speed and delivering a comfortable dry ride in seas that have literally demolished other boats.

Commercial divers are not the only ones to capitalize on the handling characteristics of Radons. Lockheed Ocean Laboratory in San Diego recently purchased a 32 foot Radon Boat for conducting environmental impact studies. The city of South San Francisco uses two Radons for harbor patrol, rescue, and fire

fighting. More and more sport divers are discovering Radons provide a whole new world of safe, comfortable transportation, and also make one heck of a great dive platform.

The shape of the Radon's planing hull is a deep vee, similar to that of many other boats on the market. Most conventional hulls are designed with strakes that angle upward directing the bow wake up along the sides of the boat. Radons have strakes that angle downward. The Radoncraft also incorporates two large 90° steps located just above the water line and running the length of the hull. The strakes and steps work together to deflect the bow wake down. This water action contributes to the lift of the boat and gives Radons an unbelievably dry ride even in the roughest water.

The smooth, soft, stable ride of a Radon is achieved by designing the hull in such a way that when it is up on a plane, the hull enters oncoming waves and swells approximately 1/3 the way back from the bow instead of directly at the bow. This enables the boat even when traveling at 25 knots to ease into the water slowly and gently rather than crash point blank into wave troughs creating bone jarring hull slap.

Additional stability in rough water is provided by the hull steps that increase the effective beam or width of the boat reducing rolling, and centering the integral fuel tank directly over the keel in the lowest part of the hull giving Radons a very low center of gravity. The overhanging deck above the bow not only provides additional deck area, but also keeps the nose from digging into large waves too deeply.

Radon hulls are constructed of solid fiberglass one inch thick on the bottom and 5/8 inch thick on the side. Many production boats have as little as 1/4 inch of fiberglass.

Even so, each Radon is constructed with a minimum of eight individual flotation compartments that are so designed that the boat would continue to float with all but two of these compartments punctured. Because of the strong, unsinkable construction and handling characteristics of a Radon, it meets the requirements for some of the lowest insurance rates available for commercially used boats.

Radon Boats had their origin in 1965 when abalone diver Ron Radon became tired of the pounding his body was taking, crossing the Santa Barbara Channel in a conventional boat. He would arrive

at the Channel Islands physically exhausted and usually soaking wet — unless the channel was in one of its more mellow states. During the abalone off season, Ron began experimenting with his own boat designs. His first version was such a ungainly looking vessel that it was nicknamed "The Thing". After 20 different boats, Ron finally came up with the present version of the Radoncraft which is in demand among professional and sport divers the world over.

I have been diving for 12 years and although I enjoy the fun and camaraderie of charter boat excursions, I have always longed for the versatility of having a boat of my own. Last summer, I decided to take the big step. I did a lot of shopping around, but after talking to several abalone divers and taking a few test rides, concluded that I had to have a Radon. I placed my order, and within a month, had a 19' x 8' yellow and blue boat built to my specifications and equipped with an inboard/outboard MerCruiser 120 horsepower gas engine. I named her the *Navanax*.

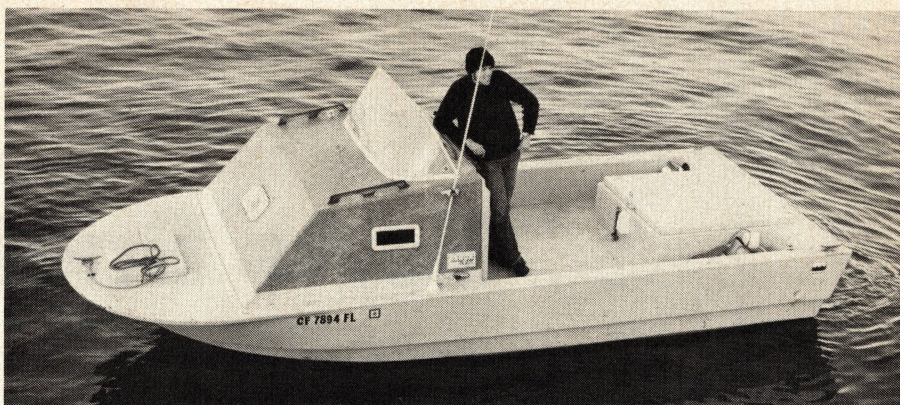
My first ride on the Radon was quite impressive. The boat sat low when dead in the water, but instantly jumped up on a plane when only a little gas was given. Despite the small engine, the *Navanax* reached cruising speed very quickly. There was a one to two foot swell running but the ride was soft and stable. The boat cranked into turns very smoothly and responsively and, due to the hull design, did not have any stern slip common to many stern drive vessels. When the throttle was backed off, the *Navanax* quickly settled down into the water for an incredibly short stopping distance.

I made my first trip to the Channel Islands in the *Navanax* with two other fully equipped divers on board. The *Navanax* was made with a forward cuddy cabin that can comfortably sleep two, so naturally my two shipmates headed for the bunks for the duration of the hour long trip to Santa Cruz Island, 26 miles away.

Once we were anchored, I began to appreciate the very large open deck area that is inherent to all Radons. The three of us had no trouble gearing up at the same time. The low freeboard enabled easy entry with a simple backward roll. Handling equipment like photography gear over the side was a cinch.

The low freeboard also became a definite advantage when exiting the water. Our method was to tie the tanks to a rope hung over the side, take off our fins, and use the outdrive as a step ladder to climb up into the boat.

One dive trip, we happened into foul weather at San Miguel Island that was producing 30 knot winds and six foot swells. Despite the heavy seas, the 19 foot boat was still easy to handle as long as we kept the speed down to prevent the



Radon boats are available in five different sizes and are compatible with a wide variety of MerCruiser gas engines and Volvo, Caterpillar and Detroit diesel powerplants.



photography by Author

boat from jumping off the top of the waves and into the troughs. Several times though, the boat did jump most of the way out of the water and we braced ourselves for the inevitable crash as we returned. It never came. The *Navanax* settled in stern first and gradually lowered the rest of her hull back down. Quite impressive. There was no tendency to broach and we continued to stay dry.

Unlike most boats, a Radon's engine box has sides that extend well above deck level so even if the deck were completely awash, the engine compartment would remain dry. A very secure feeling in nasty weather.

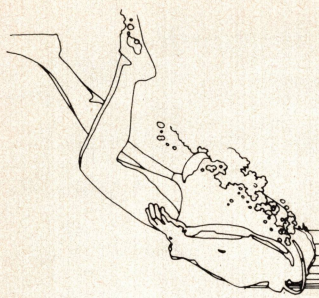
Radons are available in five different sizes: 19 x 8, 24 x 8, 32 x 10, 36 x 12, and 42 by 14 feet. They have complete compatibility with a wide variety of MerCruiser gas engines and Volvo, Caterpillar and Detroit diesel powerplants.

The most popular Radon is a 24 x 8 with a 255 MerCruiser gas engine, a 270 gallon fuel tank (giving it a range of over 400 miles), and a forward cuddy cabin that will sleep two. This boat weighs in at

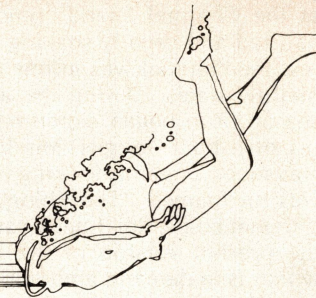
approximately 4000 pounds making it a boat that can easily be trailered. The cost for such a boat is \$10,000 which, in most cases, is less expensive than pleasure boats of similar dimensions. Although the hull design is never altered, the remainder of the boat is built to the buyer's specifications.

There are presently five Radon boat yards scattered around the world, each catering to a specialized clientele. The Washington yard builds boats mainly for gill net fishermen, Hawaii for black coral divers, Alaska for crabbers and salmon fishermen, Singapore for the offshore petroleum industry, and the Santa Barbara yard for commercial abalone divers and sport divers.

Radons may not have the luxuries of deck carpeting and pleated cushions, but they weren't made for people who want to spend a lot of time lounging on the surface. They were made for people who want to dive. They were designed by divers for divers. It just so happens they offer one of the most comfortable, dry rides since the *Queen Mary*. ☛



News Briefs



By Hillary Hauser

"CODFISH"

When *Jaws* came out in Brazil, audiences reportedly laughed off the whole thing as a fake. Now, a young Brazilian film maker has come out with a spoof of the famous picture... it's called *Bacalhau* (Codfish).

Adriano Stuart, 32, who wrote and directed *Codfish*, says the story is much the same as Benchley's, in which a great white shark terrorizes a resort town. But Stuart's monster is a codfish that is so obviously fake that it has *Made in Brazil* written on its tail. The fish is made of cork and fiber glass and pulled through the water by visible nylon cords. At first the producers wanted to make the fish move by putting a man inside it, but no one would take the job because, says Stuart, "there wasn't any air in there."

There are a few differences between *Codfish* and *Jaws*. For one thing the newer monster has a marked preference for female swimmers, especially those wearing bikinis. In the scene where the fisherman and his young assistant are supposed to harpoon the codfish, the nylon cords get tangled and the fish does not come close to the boat. So, the heroic oceanographer, played by Stuart, jumps overboard and saves the day by punching the cork and plastic monster in the nose.

Codfish cost \$100,000 to film, which is said to be a relatively high budget for a Brazilian production.

MEAT FOUND

A Japanese cargo ship entered the U.S. port of Maya-

quez, Puerto Rico, last March to unload a shipment of yellow-fin tuna, and U.S. customs officials discovered nearly one million pounds of whale meat (fin, sei, minke) in the hold. The ship had picked up the meat from the Japanese catcher *Kuyo Maru 3* on the high seas and was on its way to Japanese ports. The master of the cargo freighter was liable, however, since it was his ship that came within jurisdiction of the U.S. Both sei and fin whales are on the U.S. endangered species list and are illegal under the U.S. Endangered Species Act. The fine? \$5000.

COLD LOVE

Onan, a turtle who lives in a crater near the Charles Darwin Research Station in the Galapagos Islands, has fallen in love with a heart of stone. Says Dr. Craig McFarland, director of the station, "There are no other turtles in the crater and Onan has fallen in love with a rock. He regularly, and passionately, attacks it."

U/W GAMES

Everyone is doing it, so we'll give them to you all at once: 140 divers played U/W Monopoly for a grand total of 501 hours at Iowa State U. The event ended when swimming coaches wanted them out because they were "in the way." Nonetheless, application is being made to the Guinness Book of World Records. Elsewhere, the Bexar County Divers Association established what they called a "world record" for U/W checker playing at the NCO Open Mess Pool. Their time — 48 hours and one minute.

WHITHER RAIN?

Could be that rain is caused by oceanic bacteria. NOAA scientist Russell Schnell thinks the bacteria acts as an active source of ice nuclei, the particles around which moisture in a cloud freezes to produce precipitation. According to an *Ocean Science News* report, Schnell thinks the bacteria live with phytoplankton and are shot into the air by sea foam bubbles bursting on the surface of the waves; then some of them find their way high into the air to become the nucleus around which the water droplets freeze.

ACOUSTIC TELEMETRY

"A diver is probably the worst indicator of how he's doing," says Lt. Comdr. David Hall of US Navy's Submarine Development Group I. Hall, who spoke last March at the "Working Divers" meet at Battelle Institute, Ohio, said that electronic monitoring of divers' physiological responses "should be routine," that just asking a diver how he feels isn't enough. According to a report we got from *Ocean Science News*, Hall talked of a new acoustic telemetry device that can send back nine channels of information such as electrocardiogram, internal temperatures, skin temperatures, breathing volume and rate. A present version of this is worn on the diver's back and has been tested in the Arctic under ice. It has proven effective in a range of one mile and worked well under 1000 ft. of water. Further development of the device will depend on the availability of appropriate sensors.

BOTTLE DROP

In June, 1000 bottles were dropped into the Gulf Stream, each with messages asking finders to fill out enclosed cards and to mail them to the Natl. Geographic World in Washington, D.C. The bottles will enable scientists to measure current shifts, all information going to NOAA. They were expected to wash ashore along the East Coast as far north as Canada, some off Greenland, and later in the year some of them will travel across the No. Atlantic to Scandinavian beaches. Other destinations: Barents Sea as far as the USSR, coast of Africa, Central America and the Gulf of Mexico.

ALGAL HELP

Red algae may be the long sought cure for a virus that infects about 80% of the world's adult population: herpes simplex type I (cold sores, eye infections) and type II genital sores and possibly cervical cancer. Two U. of California researchers have since 1974 examined the antiviral properties of 29 varieties of red algae common in northern California waters. The resulting solution from the sea plants proved 99% effective in stopping viral multiplication in human cells that were inoculated with the virus, and 50% effective in cells already affected. The scientists, virologist E. Frank Deig and Graduate Student Douglas Ehresmann believe the extract would also inhibit other types of herpes viruses that cause chicken pox, shingles and mononucleosis. They foresee two more years of tests before the extract would be available to humans.

SAVING LIVES

The California town of Mendocino has recently popped into the news because of a very verbal group of antiwhaling folks making a good bit of noise. One protester is Mendocino Rose, an anonymous Russian-turned-Californian who comes on marine radios and appeals to Russian whalers to get out of their business (NB, May). Now, a Mendocino group has gone to sea in a type of Greenpeace effort, to put themselves between the whalers and the whales. Byrd Baker, leader of the 10 member crew, said they planned to rendezvous with the Russians 100 miles north of San Francisco. "We'll save some lives," said Baker.

BOMBS OPPOSED

The divers of Maui, Hawaii, have joined a letter writing campaign to protest U.S. Navy practice bombing of Kahoolawe island and the U/W detonation of dud bombs near Molokini. We heard about this from reader Art George, who writes that Kahoolawe has been owned by the military since 1941 and has been used for target practice since that time. Congresswoman Patsy Mink is calling for the return of the island to the people and has supported a study to determine the cost of clearing the island and its surrounding waters of unexploded ordnance. The U/W reefs around Molokini have been popular dive spots, but are currently subject to U/W blasts from bombs being detonated by the Navy. Bob Chambers of the Hawaiian Pacific Dive Shop in Wailuku is one of those trying to have Molokini's waters made into an U/W preserve. Divers who come across such bombs are not reporting them to the Navy, says Chambers, because they are afraid the Navy will go down and blast away big chunks of reefs just to get rid of them. Chambers suggests that interested divers write Mayor Elmer Cravahlo of Maui County, Hawaii, to pressure the issue.

COUSTEAU UNCOVERS AEGEAN TREASURE TROVES

Capt. Jacques Yves Cousteau and his *Calypso* team have located remains of ships from 17th and 18th century battles, have found sunken remains of Byzantine, early Greek, Prussian, Minoan civilizations, and have recovered ancient Greek treasures from the floor of the Aegean. Cousteau, who was granted \$1.6 million from the Greek government for his project, began to work last November around Crete and the island of Ardikithira, in the Aegean, to film his archaeological explorations. Shipwrecks found dated from as early as the 1st century BC and specific finds included gold, bronze and clay antiquities. According to press reports, the most valuable part of the trove were three gold bars, a gold ring and a finely engraved jewel studded necklace. Also found were clay vases, columns of clay embedded coins, and a life-size marble hand from a statue. The Greek government, in return for the grant, will receive all archaeological artifacts, as well as tourist and film benefits from the project.

Cousteau's group also discovered an entire sunken harbor off Dia, an uninhabited island off Iraklion, Crete, which had incredible remains, a 1668 ship off the northern tip of Crete, and off the small island of Kea the team discovered the *Brittanic*, a 919 ft. ship sunk during WW I with 2500 passengers and 950 crew aboard. The interior of the ship was filmed successfully by the group.

On the subject of his find, Cousteau lamented, "The Greek seas are a paradise of ancient treasures and history. But time and nature, as well as plundering pirate divers have already destroyed much." He noted that the looting has primarily taken place in waters up to 65 feet.

The group had plans to continue to investigate the waters around Thira Island, believed to be one of the locations of the legendary city of Atlantis. In an interview, Cousteau said he did not hope to find Atlantis, but perhaps to explain the myth of Atlantis... "maybe."

The Aegean explorations will be part of Cousteau's new television series which will be televised nationally by PBS for three years. (His *Undersea World of Jacques Cousteau* was not renewed by ABC for this season, in spite of eight Emmy awards it has received since it began to air in 1968.) Says Cousteau, "I think the networks are trying to murder non-fiction films."



photo courtesy Cousteau Society, Inc.

MUSEO DEL MAR

In Mexico a unique marine museum is being built in Huatabampo, Sonora, that will specialize in whales. The museum was spawned during considerable oceanographic activity in the area under the wings of the Mexican Government's National Program for Education in Ocean Sciences and Technologies. We heard about the museum from Jose M. Castello, diver film maker, who took part in an expedition with three American cetologists who went to Huatabampo to study the stranding of 17 sperm whales. The Americans, pupils of Dr. Ken Norris, mammalogist from UC Santa Cruz, and Castello put together an entire whale skeleton measuring 33 feet in length and gave it to the museum.

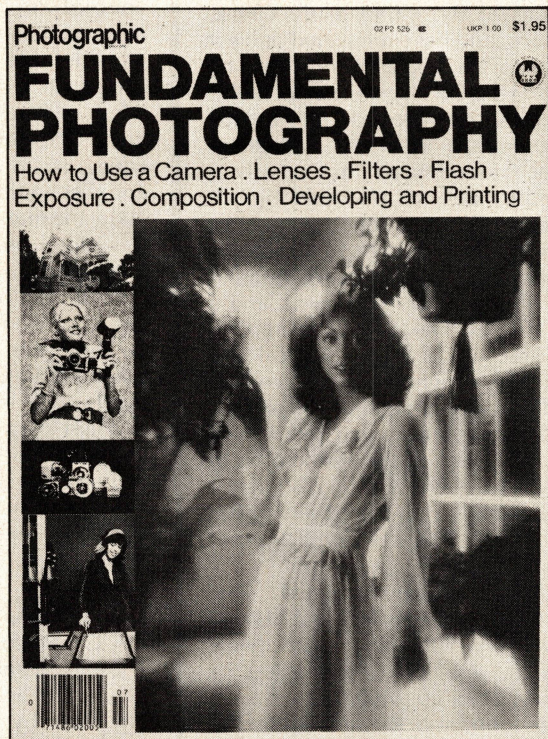
OCEAN CENTER

A Center for Ocean Studies is being established at Historic Gardner's Basin, Atlantic City, N.J., by the Mid-Atlantic region of the Oceanic Society (publishers of *Oceans Magazine*). The center will have research vessels and a 20-foot submersible, and was scheduled to open last May.

ODDS & ENDS

Last Oct. 9 was the first Leif Ericson Day celebrated in the U.S. President Ford, one of the many who believe the Nordic sailor beat Columbus to it, designated the day last summer... A recent meeting of the California Advisory Board on U/W Parks and Reserves was held under 10 ft. of water in the pool at Exposition Park, Los Angeles. The stunt was to publicize the U/W Explorations exhibit at the Museum of Science & Industry... A vessel carrying 37 students and teachers from Pepperdine U. Calif., was missing for 24 hours off the coast of Papua, New Guinea, but was found in good shape by search planes. The students were scheduled to make an oceanographic study of the Wuvulu atoll.

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THE PBM

On the afternoon of January 3, 1944, Lt. Jack B. Chase commanding the sea-plane #6672 attached to squadron VR-8 out of Patuxent Naval Air Station, Patuxent, Maryland, was checking out a student pilot at the controls of this new aircraft. The plane, built by the Glen L. Martin Company, was a gullwing aircraft used as a long-range reconnaissance bomber, of the type still used by our United States Coast Guard for search and rescue. The student pilot was practicing takeoffs and landings from the waters of the Chesapeake Bay just inside the mouth of the Choptank River.

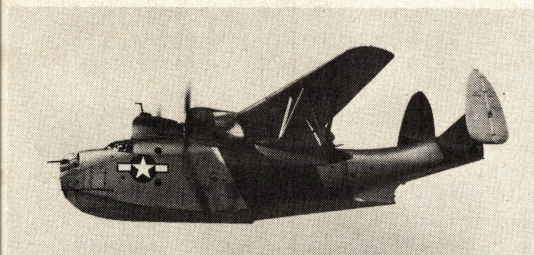
He was doing fine and Lt. Chase was about ready to qualify him when it happened! Attempting a takeoff, the young Ensign suddenly lost control of the huge aircraft, dipped the port wing tearing the pontoon float off, causing the plane to cartwheel across the water several times before coming to rest. She was listing badly with water pouring in through the main cargo hatch, but miraculously still afloat and upright. Realizing she was going down, Lt. Chase acted quickly ordering his men to inflate the emergency



rafts and abandon the plane. Everyone was barely out before the craft filled and sank. The battle for survival was not yet won, for it was mid-winter and the water temperature was a brisk 38°F. The bulky flight suits were extremely heavy as they became soaked, making it difficult to maneuver the rafts ashore. One of the crewmen panicked, jumped into the icy water and almost drowned before Lt. Chase could get to him and pull him back into the raft. They paddled their way to shore and while the crew built a fire to dry out, Lt. Chase walked to a nearby farmhouse to summon help from the base. Within an hour, another PBM

WRECK OF CHESAPEAKE BAY

By H. Richard Moale



plane landed, picked them up, and all arrived safe back at the base, except for a few cuts and bruises.

The PBM settled to the bottom at 30 feet, laying on her side with one wing tip partially jutting above the surface. The Navy abandoned the idea of raising her and she soon became the habitat for local marine life. The exposed wing tip did not survive very long, for one night seven months after the plane went down, a local fishing boat struck it and sheared it off, destroying any visible marker of where the plane now lay. Nearly 30 years passed, and other than a few fishing boats and some local watermen knowing her location, she lay forgotten.

On the morning of December 15,

1973, our dive group from the Maryland Hydronauts boarded the *Sandra*, a typical Chesapeake Bay oyster boat. It was a beautiful day, the sky was clear and there was no wind, making the 48°F. temperature seem comfortable for this time of year. After loading the seven of us, and all our gear aboard. Capt. Donald Gowe eased the *Sandra* out of the cove at Tilghman wharf and headed out toward the entrance of the Choptank River just northeast of the Sharps Island lighthouse.

Underway about 15 minutes, the Captain slowed the boat and began looking in various directions for his marks. This is when Don's waterman know-how and years of working the waters of the Chesapeake Bay paid off; for, without the aid of any kind of depth finder or compass bearing, and by referring to some points on shore and the way the water looked, he dropped the hook right on the plane with the first try. Captain Don had taken a few of us to the plane several times over the past two years, and his fantastic sense of dead reckoning never ceases to amaze me.

Well, here we were again on the big

plane and I wondered to myself as I suited up how the visibility might be this time, as usually it was not very good due to the bottom being mud and the tide running. Looking over the side, I could see the anchor line down to about eight feet, but this was no indication of how good the visibility might be on the bottom even though the water was calm. Well, only one way to find out — grabbing my goodie bag, with the vision of filling it full of the oversized oysters that grow along the fuselage of the plane, or perhaps some souvenir from the yet-to-be-found cockpit, I ungracefully exited over the gunwale of the *Sandra* and practically bit the mouthpiece of my regulator in half as that first rush of cold 43°F. water entered my wet suit. I quickly put my flippers into high gear and swam toward the anchor line, trying to think warm thoughts until my body could warm up the water trapped inside the suit. Reaching the anchor line just ahead of my partner, I rechecked myself to make sure I hadn't left any equipment back on the boat; and, finding everything

(Continued on Page 60)

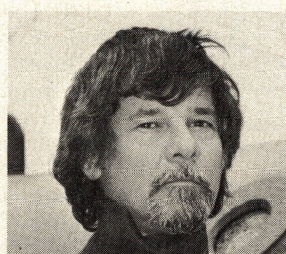
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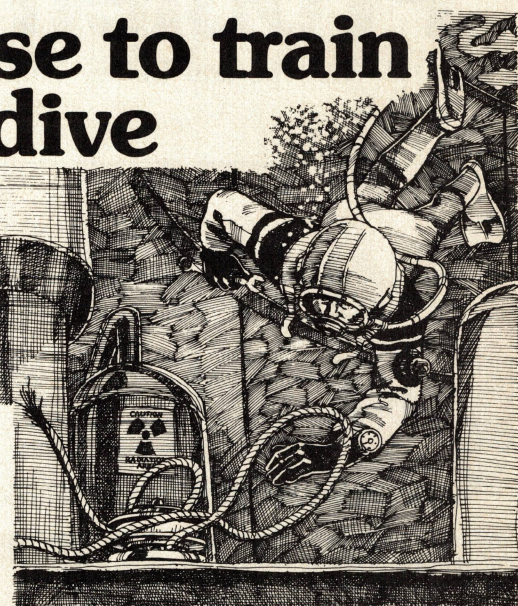
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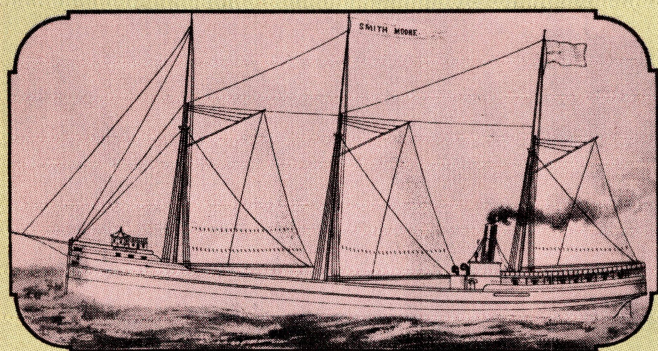
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Michigan's Wreck Problems

By George and Bettey Tomasi



Smith Moore was wrecked June 13, 1889 and now rests in 110 feet of water in the east channel of Munising Bay, Lake Superior.

There is no question that the leaders and participants in the field of sport diving have taken giant strides to safely train and regulate the activities of the growing ranks of underwater enthusiasts. Statistics put forth by the Rhode Island Report, the National Scuba Training Council and other responsible diving leaders bear this out. Hence, the California legislation and any other state proposed regulation which inhibits the freedom of the trained sport diver to explore, research, photograph or enjoy in any responsible way, his underwater environment is nothing short of ludicrous!

But, aside from the safety oriented diver, there is yet another breed of diver. He is wantonly salvaging valuable and historically precious shipwrecks to convert them into shiny, sand-blasted (and, extraordinarily expensive) coffee tables, lamps, knickknacks and bar stools — the latter being most appropriate for some dives but, certainly a travesty to the esthetic values of the underwater lover.

It is necessary for the reader to realize at this point, that the entire Great Lakes system has played an important historic role in the development of Michigan in that the pioneers, traders, Indians, army troops, mining industries and others depended heavily on these waterways for transportation. Hence, over the centuries, literally thousands of vessels, unable to reach their destinations for one reason or another are now resting in pieces in their watery graves. Since Michigan waters are, by geographic nature, cold, these wrecks are virtually the only attraction which entices the increasing numbers of sport divers to plunge into her frigid depths.

Michigan's Department of Natural Resources, (DNR), fully cognizant of the furniture manufacturer's wreck "rape-off" has been struggling for years to protect the irreplaceable ships resting on the state owned bottomlands. With an eye to protecting this heritage, the DNR has instituted a permit system which requires all divers, both sport and commercial to acquire a permit whenever salvage of any wreck or parts of same is being considered. This is not a permit to dive (which is not required) but, rather to salvage . . . an important distinction. Sport divers acquiring this permit are allowed to recover small, unattached items such as dishes, brass fittings, nails etc. but are not supposed to use cutting tools, lift bags or other mechanical means to recover artifacts. Commercial salvage requests are carefully reviewed before they are either issued or rejected. Permits can be acquired at no cost when approved.

The precedents cited for these actions were, prior to April 1, 1974, the Antiquities Act of 1929, which require a permit from the Department of Natural Resources for archaeological research on state owned lands and, the Submerged Lands Act of 1955. Since the letter of opinion of the Attorney General, dated April 1, 1974, the DNR has relied on the authority described in Act 17 of the Public Acts of 1921, which created the department and provided it with control over state owned lands. The controversy continues to rage, regarding how much underwater territory this encompasses.

The Attorney General feels that further legislation is necessary, referring to current House Bill 4185 as, if passed, it would clearly establish the state's ownership of these bottomlands with all existing remains and, therefore establish the right of the DNR to protect them.

The entire situation came to a head in January, 1968, when William C. Whitbeck, Administrative Assistant to Governor George Romney, informed an individual from Spokane, Washington who wanted to salvage a vessel in Michigan's territorial waters of Lake Erie, that the 1929 Antiquities Act did, in fact, prevail and that a permit from the then Department of Conservation was needed. Early in 1970, at the urging of the DNR, an action was instituted by the Attorney General in circuit court, against an individual who removed the anchor from the *John Jacob Astor*, a historic fur trading schooner which had gone down some 130 years before off Copper Harbor, Michigan. It was in September of 1970 that the Department of Natural Resources recognized that it was impera-

tive that some types of administrative action be initiated due to the increasing clamor from professional historians regarding rapidly increasing disappearance of these valuable artifacts. At this juncture, a field order was drawn and dispatched to the Regional Managers. The order said, in part, "... therefore, until judicially overruled, we, (the Department of Natural Resources) deem Act 173 as controlling and the following policy shall govern removal of property of historical value from the bottomlands of the Great Lakes and Lake St. Clair." From this field order, the earlier mentioned permit system evolved, but, it has not been without its problems.

In spring, 1971, the permit system for salvaging not only in Michigan bounded Great Lakes bottomlands, but also in Lake St. Clair, was published and implemented. A committee was formed which included leaders in the fields of diving and natural resources. It is significant to note that the committee was comprised of people who knew what the problems were and were keenly and conscientiously involved in solving these problems. They were not land-lubbing legislators who were totally unschooled in the field into which they were delving.

The committee, known as the Underwater Salvage Committee, was charged to "iron out some of the wrinkles" in the permit system and improve upon any pending regulations. In addition to reiteration of the assurance that no fees would be charged to obtain permits nor would a permit be required to dive without intent to salvage, the committee recommended that all artifacts brought up by divers and subsequently donated to the state for public display, be properly identified with the salvor and/or donor's name. It was also decided that items with historical value would not be claimed by the sovereign (state) unless a marine museum to house said objects had already been established and the donation would be put on immediate display... that is, it would not be stored indefinitely in some warehouse with neither the state nor the donor appreciating its significance. During the period of these proceedings and subsequent reasonable regulations, the DNR and the Michigan diving enthusiasts enjoyed mutual respect, cooperation and input into the program.

During the summer of 1973, a student law clerk in the Attorney General's office made an exhaustive study of salvage rights, Admiralty Law and the rights of the U.S. government vs. state rights. As a result of this study, a letter, Attorney General's opinion, was issued on April 1, 1974. The opinion, in short, stated: a) the lake bottoms belong to the state; b) they are to be held and controlled by the DNR; c) the DNR has the authority to make rules for protection of lands and property under its control; d) except as to navigation, there has been no grant of power to the federal government; and e) the DNR may control or even prohibit exploration and salvage operations. Much of this opinion was based upon the fact that Michigan accepted English Common Law when it became a state and that Common Law holds that abandoned property belongs to the sovereign. However, the one Michigan case on record, *Murphy v. Dunham*, 38 F. 503, 1889, adamantly denies assertion of state ownership in the absence of a state statute which expressly so provides.

Examples of federal cases favoring the finder over the state are: *Thompson v. one anchor and two anchor chains* (221 Fed. 770 Wisc. 1915); *United States v. Smiley* (27 Fed. Case no. 16, Calif. 1964); *Cunard S.S. Co. v. Melton*. (262 U.S. 100, 122, 1923); and *Richard v. Pringle*, (293 F. Supp. 981 New York 1968). On the other hand, the state of Florida, in 1956, took a salvage case based on common law to the Florida Supreme court (95 So. 2d. 902.) That court held that the state had possessory right or title to a wreck which sank within the territorial limits of the state.

In view of these conflicting rulings, it is not difficult to understand why the Attorney General is reluctant to prosecute or to seek an restraining order.

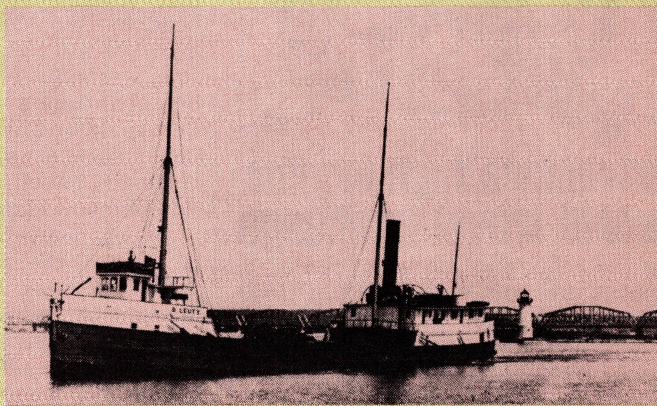
Meanwhile, back at the DNR, the permit system appeared to be winding down due mostly to a lack of means and/or funds

for enforcement. While the agency can bark loudly, its bite seems to be minimal or nonexistent! The number of permits issued in 1973, 472, decreased in 1974 to 250 indicating that the dive community, while expanding its active ranks, has come to the realization that the permit system is not working.

In some areas of Michigan, funds have been allocated with the purpose of research and study toward the establishment of underwater parks with, hopefully, preservation of all wrecks in mind. Without some protection from blatant commercial destruction, these funds will be wasted on an exercise in futility.

Despite these problems, a memo, dated May 27, 1975, was received by these writers from George Bruso, Law Executive, Law Enforcement Division, DNR in Lansing, which makes the state's position quite definitive. The memo in part states...

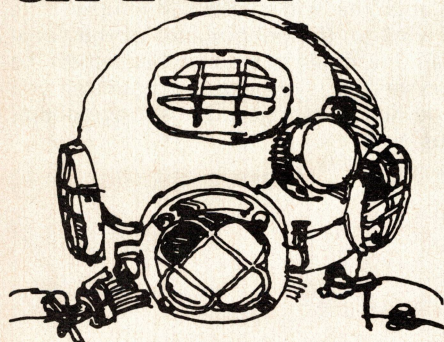
"At a recent meeting held in the Attorney General's office regarding the salvage of historical objects from the bottomlands of the Great Lakes and Lake St. Clair, we were assured their opinion letter of April 1, 1974, is still forceful. In this opinion letter, the Attorney General stated that the State of Michigan owns the bottomlands of the Great Lakes and has the authority, under Act No. 17 Public Acts 1921, to protect it against wrongful occupancy and depredation. Such lands and property were to be preserved from molestation, spoliation, destruction or any other improper use of occupancy. The office of the Attorney General intends, through civil action, to protect artifacts from unlawful removal from these bottomlands. It was strongly stated that the language of the Antiquities Act (1929) is sufficient to support the enforcement of the permit system as established years ago. A supportive pledge has been received for the enforcement of this system. We continue to seek legislation that will spell out Michigan's title to historical artifacts lying on the bottomlands of the Great Lakes and Lake St. Clair. Inasmuch as we will, henceforth, be enforcing the permit system, it is respectfully requested you inform those about you, who are engaged in salvage operations, of our intentions."



photography by Authors

Above is the D. Leuty that sank 1000 feet off shore near Marquette, Michigan in 30 feet of water. Left is the wreckage of the S.S. Monarch off the north shore of Isle Royale, Lake Superior. Smashed on impact with stone pallsades, the wreckage was strewn about in depths from 35 feet to 80 feet.

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PBM Wreck

(Continued from Page 57)

in order, I slowly pulled my way down the anchor line, straining my eyes each foot of the way, hoping to see the plane before I bumped into it, which was usually the case.

The tide was slack and my expectations of good visibility proved to be better than normal, six feet on the bottom! What luck! There she was — just ahead of the anchor, the big fuselage jutting from the mud about eight feet. I immediately forgot the cold as I opened my goodie bag and began stuffing it with the succulent oysters plucked from the side of the aircraft. As my partner and I busied ourselves with the gathering of oysters, I scanned the hull for some recognizable part of the seaplane to determine where I was. This was difficult, for the years had taken their toll. Her hull was badly twisted and deteriorated, barely recognizable as a once proud aircraft. The tail section had broken away and lay nearby; and what was left of the main section, was carpeted by a rich growth of marine life, intermixed with old fishing lines and oysters, to which I was helping myself.

Moving along the upper part of the hull, I came to a large rectangular opening, which must have been the main hatch on her port side. There was no door and it looked large enough for me to enter without any problems. I poked my head and shoulders through for a look. Wow! I wasn't going to go in there! Inside, was a maze of hanging wires, cables, and fishing leaders. Realizing that this would be a likely place to get trapped, I backed out of the opening and contented myself with working the outside of the fuselage.

My bag nearly full, I continued along past what I thought to be the wing to another opening. This one was different than the hatchway I had encountered before. Jagged, twisted pieces of metal were hanging off the hull with what looked like pieces of broken glass attached to some of them. Looking around, I noticed something like a smooth black handle sticking out of the silt and marine growth. I grabbed it and it moved, exposing the other side. A yank on it brought it into full view and my heart nearly stopped. In my hand was the pilot's yoke! Almost with reverence I grasped it, realizing no one for almost 30 years had held this control. I was running low on air and the cold was beginning to numb my limbs as I wrestled with the wheel, trying desperately to break it free from its mounting. Oh, my kingdom for a hacksaw. My dive knife was of little good, for the wheel was still fastened and would not come loose. If desire could turn me into superman, I would surely be sporting a red cape right now; but alas, I was

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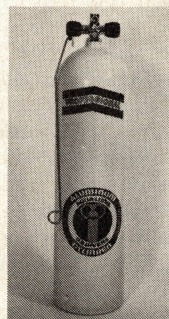
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running out of time and luck, so I reluctantly let go, inflated my B.C. vest and headed for the surface. Fortunately, it was a short swim back to the boat after I broke surface, for my body now ached with cold and fatigue. The oyster-filled goodie bag seemed to weigh a ton as I struggled to hand it up to Captain Don. I related my find to everyone, and Ron Baker, who still had some air and strength left said he would give it a try. We asked the Captain if he had a hacksaw, but no luck. So, with only his bare hands and the best description of the wheel's location I could relate, Ron jumped in and disappeared below the surface. We watched his air bubbles as he worked his way toward the area from which I surfaced. I knew if anyone could find that wheel, Ron could. He was a skilled diver with a good sense of underwater navigation. His wife and the rest of us watched Ron's bubbles anxiously, trying to determine where he was. Time seemed to stand still for the next 15 minutes; but suddenly, Ron's head broke surface and held high in his hand, the plane's wheel! We cheered and practically jerked Ron out of the water as he came alongside the boat.

Back on deck, Ron explained that he had to snap the wheel in half in order to get it off, but surprisingly, it was still in fair shape after all those years. It was made of thick hard rubber, molded over an aluminum frame core. The salt water had gotten into the core, crystalizing it, which caused it to break.

By the diver's unwritten code, the prize belonged to Ron, but he and I agreed that it should be given to Commander Jack Chase, USNR (Retired) who had helped us in our research to find the big plane.

This had been a perfect day. One of those dives that makes all the rough weather, zero visibility dives worth the sport. We got our limit of oysters and shared the experience of a trophy to be long remembered. Back home, Ron very capably glued the wheel together and mounted it on a plaque, complete with an inscription. He presented it to Commander Chase from the Maryland Hydronauts on WBZ-TV, Boston.



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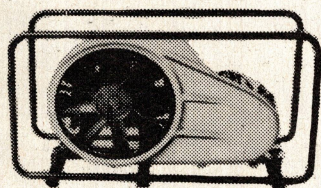
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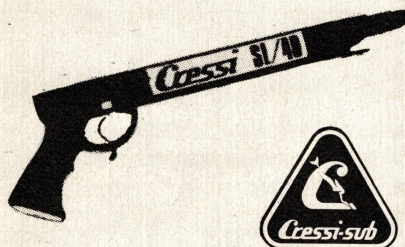
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DEMA Trade Show

The Diving Equipment Manufacturers Association (DEMA) has announced plans for the First Annual Diving Industry Trade Show to be held January 15 through the 18th at the Sheraton-Four Ambassadors Hotel in Miami Beach. This retail oriented show will feature exhibits and special presentations by virtually every major American diving equipment manufacturer. Proceeds raised from the show will go toward support in protecting the sport of diving from restrictive legislation.

No expense has been spared over the last several months of extensive planning to make this the best and most informative show ever held for the retailers. Exhibits will be open from 9 a.m. to 5 p.m. on Sunday, Jan. 16, and will be followed that day at 6 p.m. with a cocktail party hosted by SKIN DIVER Magazine.

On Monday, Jan. 17, DEMA will present a dealer seminar. Beginning with breakfast at 8 a.m., this intensive workshop will feature in depth examinations of topics and issues facing the modern equipment retailer. Presentations will cover such topics as "DEMA and What It Does for the Trade" by John Cronin, President of U.S. Divers — a topical discussion of the growing role of the trade association in today's rapidly changing market place; Ralph Shamlian, President of Tekna will give an inside view of the recent OSHA battle in his discussion of "Legislation and the Industry," and Paul Tzimoulis will draw from his vast photographic and promotional background with "In Store Promotional Activities" — a look at the latest in audio-visual tools for the modern retailer. Additional subjects to be discussed will be "Marketing Tips for Profitable Retailers," "How to Make Your Assets Work for Profits" and other business oriented programs.

Special events have been planned for the spouses and family members of dealers attending the show. The registration fee is \$10 and reservations may be made by writing to: DEMA, 2064 North Bush, Santa Ana, CA 92706. Reservations and deposits must be received before December 15.

Physicians U/W Medicine Program

Anthony's Key Resort on the island of Roatan in Spanish Honduras has been selected as the site for the Fourth International Physicians Underwater Medicine Program on January 22-29, 1977.

The academic program is sponsored by the Undersea Medical Society and approved by the American Medical Association for 25 continuing medical education credits. This course has been awarded the coveted Category I accreditation by the AMA.

The medical program director is Jefferson C. Davis, M.D., vice president of the

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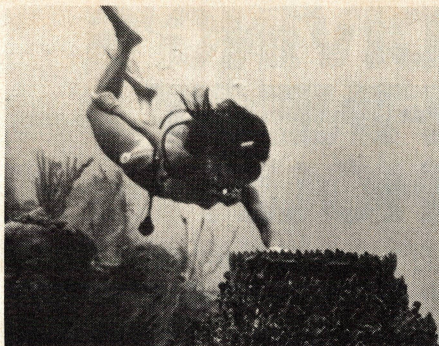
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Submersible Rescue

A Harbor Branch Foundation, Inc. documentary film was recently made by photographer Jordan Klein off West End, Grand Bahama. The film recorded a reconnaissance dive to a depth of 1000 feet. It shows the full capabilities of the foundation's rescue techniques in operation using two Harbor Branch submersibles and Sea Guardian CORD (Cabled Observation Rescue Device) as well as the several other retrieval devices.

Upon return to Fort Pierce, Florida, location of Harbor Branch Foundation, a 600 foot lock-out dive was made on the Continental Shelf offshore using Johnson-Sea-Link II as the lock-out submersible and Johnson-Sea-Link I as an observation/stand-by sub. This was the second deepest lock-out dive in the world from a submersible.

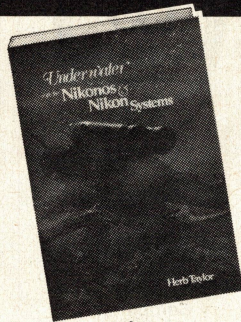
The team completed 18 hours of decompression having transferred from the submersible dive compartment to the mother ship decompression chamber.

Also aboard to photograph this historic event was Louis Marden of National Geographic magazine. Sylvia Earle, Ph.D., California Academy of Natural Sciences, participated as scientific observer directing the collection of specimens.

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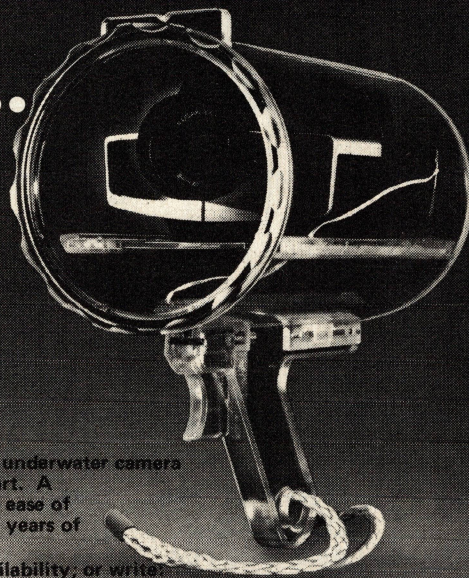


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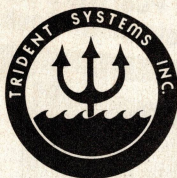
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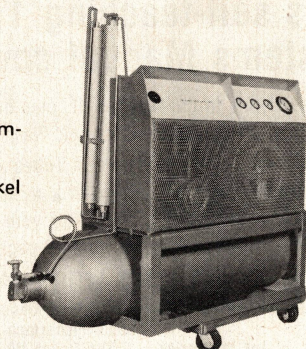
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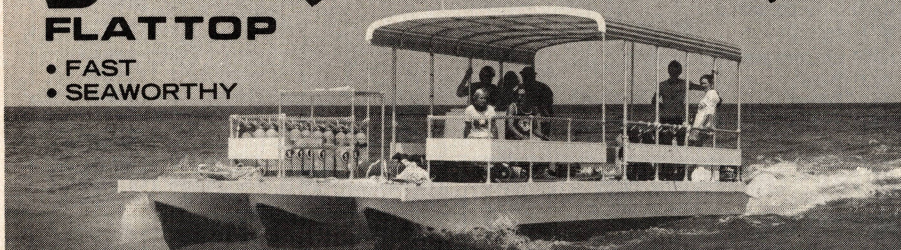
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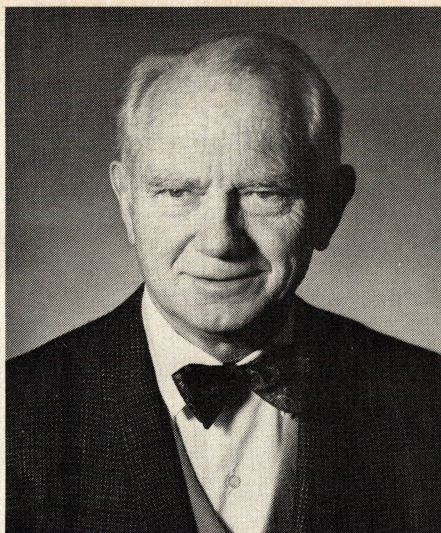
The day Al Behnke rode through the streets of Milwaukee

By Dr. Edgar End

There have been many famous rides in history. Those of Paul Revere, of the Headless Horseman, and of that famous equestrian streaker, Lady Godiva, come immediately to mind. But for sheer elegance and breathtaking drama, no ride in history can equal an unpublicized trip through the streets of Milwaukee on April 28, 1945. Not since the tumbrels tumbrelled through the streets of Paris on their way to the guillotine has the sidewalk crowd been so impressed. As they watched in wide-eyed wonder, strong men paled, women wept and clutched their babies to their bosoms, older children stopped stealing hubcaps or breaking bottles in the streets, and drunks painfully raised their heads from the gutters to stare in red-eyed awe at the memorable sight. What they saw was a flatbed truck slowly rumbling through the streets of Milwaukee and carrying a strange device that resembled either a large sewer pipe or a small boiler, depending on whether your major prior experience had been with sewers or boilers. This object was completely surrounded by a heterogeneous crowd made up of workmen, dignitaries, and a few wild-looking characters identifiable as scuba instructors.

Little could the peasants at curbside know that they were witnessing dive history, for the object on the truck was a portable recompression chamber and its occupant was Jack Browne, who had just set a new 550 ft. record in a wet pot, had been partially decompressed, then transferred to the portable chamber, and was on his way to the Milwaukee County Hyperbaric Unit to complete his decompression. What a day of records: a record dive, a number of decantings and recompressions, and transfer in a portable recompression chamber. Surely this was a great step forward for all mankind!

But if the citizens of "Sudstown", USA could not know that history was being made before their eyes, what held this mass of humanity thus spellbound? What emptied the taverns and brought into the streets Milwaukee's staunchest devotees of the brew, their neglected steins dripping in their hands, and their eyes blink-



ing in the unfamiliar daylight? Surely it was not the sight of the portable recompression chamber. It was not the men who clung desperately to the chamber to keep from falling off the lurching truck. It was one man alone who brought all activity to an awed, respectful standstill. It was a young, handsome, clean-cut, clear-eyed, inspiring, heroic, stalwart officer in Navy uniform who stood alone like a figurehead in front of the chamber, not deigning to reach for support as his lithe, trim body, trained by years at sea on the pitching decks of storm-tossed ships, stood firmly erect, his face turned resolutely forward and his steel-blue eyes seeing in the future the great good to all mankind which this experiment would bring. The afternoon sun bathed him in a golden light, as though all nature acknowledged his dominion, and as the crowds surged forward to catch a better sight of this magnificent figure or stood with heads bowed in awe and reverence, the nobility of the man was revealed as, with his hand raised as if in benediction, he graciously turned from side to side to accept the homage of the crowd.

This, then, is the Al Behnke I best remember. In the more than four decades during which he has been identified with diving, he can become a legend. He has received every honor awarded in his field. His work forms the cornerstone of every major advance in undersea medicine. From scuba neophyte to sophisticated habitat dweller, no man enters the sea today who is not indebted to him. He is a diver's diver and the only one who bears the affectionate and respectful title of "Old Man of the Sea." Al and I have been friends for longer than either of us cares to be reminded, and I look back on those years with pride and pleasure in our association. Best of all was the fun we had working together in the early days of modern diving when our most sophisticated instruments were a watch and a slide rule. Today I look with growing amazement at the apparatus available to a researcher, but

(Continued on Page 70)

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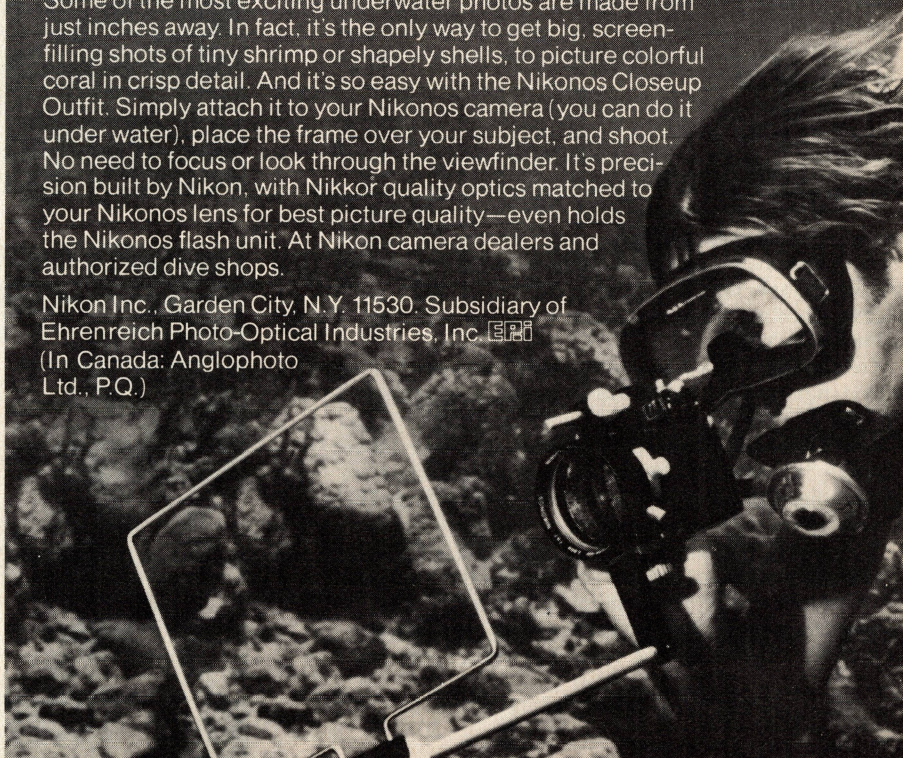
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Coral Reef Damage

Nature More Destructive Than Man

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North America is producing new divers at an almost alarming rate. They are predominantly male, approximately 26 years old, and earn an average \$21,000 annually. Over two-thirds of these new divers have attended college and more than 80 percent will take a dive vacation this year, during which they will each spend slightly over \$500.

By the close of 1974 there were over 800,000 certified divers, according to internationally recognized organizations. This indicates that sport diving is approaching the popularity threshold skiing enjoyed two decades ago.

If one interpolates the latest available statistics, he will note that almost a quarter million divers will vacation in the Caribbean this year, bringing with him more than \$125,000,000 in disposable income.

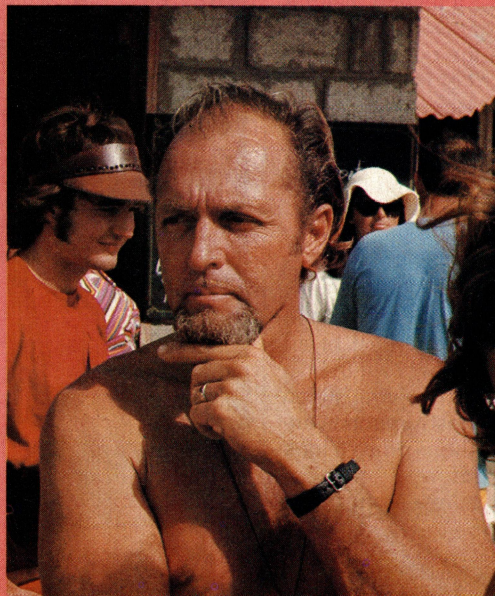
It thus becomes obvious that sensible reef management is an immediate necessity. To not be cognizant of the dangers of mismanagement is to threaten the economic health of our islands. We must constantly remind ourselves that a reef is a once in a lifetime occurrence.

Frequently I question my own judgement as to why I pursue the diving tourist with such zest? Are we doing the right thing, when we push them onto the reef almost gristmill style? Often these divers move through the water as if head and body were of separate ownership, oblivious of the damage they inflict. The reason we excuse this abuse is, of course, monetary.

We estimate that since the dive industry was founded on Bonaire, 13 years ago, that divers and their families have brought over 10.5 million guilders or over six million dollars to the island. Presently this industry is directly responsible for ten jobs here on Bonaire;



photography by Paul Tzimoulis



By Capt.
Don Stewart



Pictured above and to the right is the beautiful coral reef of Karpata before the violent, destructive storm swept away much of its beauty. Left, is Capt. Don Stewart, founder of the Aquaventure Dive Complex at Hotel Bonaire. Capt. Don is an advocate for reef management to reinstate and perpetuate the reefs on the island of Bonaire.



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indirectly diving employs 68% of the hotel's staff. We are utilizing our only natural resource.

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At this writing we have escorted 114,593 divers onto our reefs. Furthermore, we project that we will add six thousand more before 1975 is complete. In 1976 we will give entry to 18,700 more divers on Bonaire. When will we reach the point of diminishing returns? We cannot predict this occurrence.

A favorite reef of mine is the Karpata reef and our diving guests concur in our conception of its beauty. Opened in June of 1954 a land entry is possible via a small pebble beach. The reef major is approached by a sixty foot channel carved through living elk and antler corals. I knew Karpata as a virgin; a half mile stand of fans and gorgonians. This reef is mazed with canyons and overhangs, even a small cave; growing and healthy in every respect.

Since that first day there have been 8,894 entries through that narrow channel to the breath-taking view below. Karpata alone accounts for a gross income of \$65,719 in dive fees, plus the dispersement of thousands of dollars in other monies funneled into the island proper. What price has Karpata reef paid for the economic benefits reaped by the island's populace? There has been damage, particularly at the takeoff point and the turning area of the dive. It may surprise you the adverse effects upon Karpata have been negligible.

Karpata is where we first began to hand feed the fish on Bonaire. By 1958 the feeding of Hansel and Gretal, the twin coneys, had become an exciting pastime for the divers. The yellowtail snapper was the easiest to tame; however, the coneys were the most aggressive feeders. In time we witnessed the entire populace of the reef to become friendly with underwater men. As we would swim across the canyon, we would be greeted by a school of mixed fishes to escort us to the exit.

Daily encounters such as this makes one realize that humans and fish are capable of coexistence. Divers of their own volition often attempt to repair the damage others have imposed on a reef. Hundreds of times I have seen a diver prop up a fallen gorgonian or reestablish black coral twigs a poacher left behind. These efforts are admirable, but do little to restore the natural state of the reef before it was disturbed.

Who are the greatest perpetrators of destruction to our reefs, our natural resource? It is not the landman with his garbage, the seaman with his dragging anchor, or the sport diver who seeks only pleasure. Not even the fisherman with his indiscri-

minate traps, the spearfisherman, nor the coral merchant who represent the greatest affront to our reefs. None can match the destruction I witnessed on the morning of July 23rd this year.

For six hours I watched six foot waves pound Karpata's beach. None but the strongest corals withstood the onslaught of the seas. Sands were stirred into suspension, carried offshore, and rained upon even the deepest of corals, whose polyps were totally incapable of stripping such mass. The lettuce corals suffered the most. The gorgonians were ripped from their attachments; entire brain corals were dislodged.

Of all of the things least expected to destroy with such fury and thoroughness was the reef's creator, Nature. The 8000 divers we have directed to Karpata could never have wrought the damage I saw after that storm. I no longer have any pains of conscience about having sent divers to Karpata. I know these enthusiasts in their memories and on film will remember Karpata as I knew it from the beginning and as it will be again.

In summary we wish to call your attention to the facts we have researched and presented to you. The Caribbean offers the sport diver a vacation spot that is second to none in the world. Sport diving is a multi-million dollar industry ready to enhance our economies and enrich our peoples. Furthermore, it is our obligation to protect this natural resource and preserve it for the benefit of future generations.

Already the Government of Bonaire has taken the necessary steps to safeguard both the island's marine life and corals. And Aquaventure has established other measures to enforce the strict compliance of these laws.

Every diver we send on the reefs is fully informed of our policies. He is compelled to demonstrate his underwater abilities on location, before he is released onto our reefs, where he is then accompanied by certified diving instructors, who are present to safeguard both the diver and the reef from harm. Furthermore, we have charted enough dive locations so that no site is subjected to overuse. All boats are moored and not anchored. In addition to all of these precautions we replant coral life, when it is deemed necessary.

Recently Mr. and Mrs. Bert Kilbride of Dive B.V.I. and John Englander, President of the Underwater Explorers Club, Freeport, have expressed substantial interest in initiating similar programs of reef management.

However, if we are to proliferate reef management and preserve this great natural resource, we must begin now. We propose the formation of a coalition of representatives from the Caribbean for the Underwater Preservation of the Eighth Continent, UPEC. The primary goal of UPEC would be to inform governments and citizens alike of our objectives and the means to achieve them. >>>



Of all of the things least expected to destroy with such fury and thoroughness was the reef's creator, Nature. Karpata reef was once teeming with elk and antler corals, fans and large gorgonians. Only Nature can restore the reef's beauty.

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Diving's Finest Hour

(Continued from Page 65)

somehow it leaves me strangely unmoved. How could anyone get excited over a bunch of machinery after having rubbed shoulders with the great pioneers of American diving, men like Chuck Shilling, Pete Yarbrough, Swede Momsen, Max Nohl, Jack Browne, Fred Roberts, and the Dean of Diving Doctors, the Old Man of the Sea himself, Capt. Albert R. Behnke, Jr.? I cherish a host of memories of these men and of their deeds, memories that time can never erase. But the greatest memory of them all came not from a microscope or from watching a new record being made. It is the memory of diving's golden hour when Al Behnke rode through the streets of Milwaukee like Lord Nelson returning from a great sea victory, waving and bowing to the crowds along the way. I remember it in shining details. Especially the part where I fell off the truck from laughing.

Hawaii Photo Tour

Two nationally known photographers will be conducting a tour for photographers and divers, to the Hawaiian islands of Maui and Hawaii this fall, according to Jodie Meadowcroft, owner of Seattle's Vagabond Travel Service.

The ten day Hawaii tour is scheduled to depart Seattle on November 27th. The first half of the tour will be broken into two groups: one for land photographers, the other for divers and underwater photographers. Both groups will spend the second half of the tour together on the "Big Island" of Hawaii.



Josef Scaylea, one of the country's best known photo illustrators, will conduct the land photographer's tour, which will include several days on board a sailboat. He has gained notoriety as a feature-news-travel photographer, author of three best selling books, and photography instructor. With more than 30 years experience in the northwest, he has won hundreds of awards and his pictorial work has been published in many well known publications.

Land photographers will visit several beautiful locations in the islands, while getting individual instruction and photo tips from Scaylea. This group will join the divers for a sunset dinner sail, after which the tour will combine both groups.

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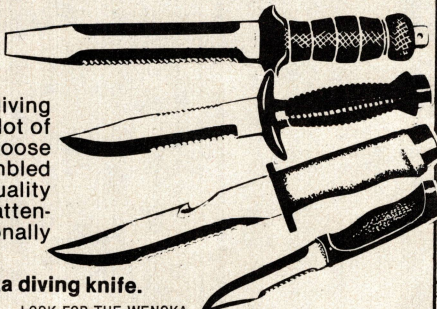
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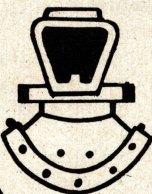
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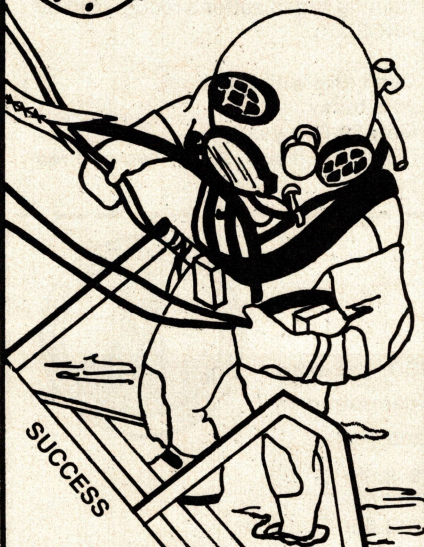
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Noted writer-photographer Cliff Hollenbeck, will conduct the diving and underwater photography tour, visiting Maui and making several dives from the beautiful *Havaiki* diving sailboat. Hollenbeck has gained national attention for travel-feature-advertising and underwater photography, with publication credit in many well known magazines. He is a certified master scuba diver/instructor with the Professional Association of Diving Instructors and is a former underwater demolition/Seal team diver and underwater photographer.

Divers and underwater photographers will see beautiful coral gardens, volcanic formations, fish and wreckage of a submarine off Maui. Following the sunset dinner sail off Kona, they will make a night dive in the unusually clear water.

Both groups will tour the big island of Hawaii, seeing such locations as the Parker Ranch, City of Refuge, volcanoes and the famous coffee plantations. Scaylea and Hollenbeck will demonstrate their shooting styles to make beautiful pictures, assisting and instructing travelers at the various locations.

"A pre-trip seminar, covering the aspects of travel and underwater photography, and diving, will be conducted by Scaylea and Hollenbeck," Meadowcroft said. "Several examples of their work will be shown, with ideas on film and equipment needed for a successful trip. We'll also have a follow-up seminar, to examine and critique pictures."

Reservations should be made immediately, as the tour size will be limited to allow individual instruction. Persons wishing to make reservations, or to obtain more detailed information, should contact Vagabond Travel Service 624-5995 at 1112 Fourth Avenue in downtown Seattle.

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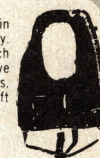
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THE UNDERSEA LEDGES OF JUPITER



By John C. Deitz

Situated on the easternmost point in Florida, the town of Jupiter is thrust out into the mightiest river in the ocean, the Gulf Stream. The stream makes its closest approach to the mainland here, where the continental shelf is but a few miles wide, bringing some of Florida's finest diving to within easy reach. Yet this quiet town is largely undiscovered by the traveling diver as he passes by unknowingly in a mad rush to get to the Florida Keys.

Located just 20 miles north of Palm Beach, Jupiter is the center of the exciting sport of drift diving. As the Gulf Stream pushes at two or three knots near shore, it is almost impossible to dive from an anchored boat. The smart diver does very little swimming here, letting the Gulf carry him along at a swift pace while a boat follows his float on the surface.

Drift diving demands a special technique and even those familiar with Florida diving are advised to seek assistance before attempting such a dive. It is far too easy to get separated from your boat under these conditions, particularly if the boat operator is not experienced in tracking the floats of two or more divers. Barnacle Bill Hughes, owner of Barnacle Bill's Dive Shop, is the man to see for trips to the Ledges. He is an expert in local waters and can supply boat trip, air, floats, and rental of all needed dive equipment.

Being so close to shore, the Gulf Stream offers some splendid diving. The Stream grows out of the tropics, and so carries with it the warmth and life of a place further south. The fish are tropical, and although there is no coral reef, some 20 species of coral can be found in the area. If you are familiar with reef diving you will probably be surprised at the size of these fish. The smaller and less healthy fish probably don't survive the rigors of life on the Ledges, while large amounts of algae provide a sturdy base for the food chain. Angelfish 18 inches across are not rare, while red snapper, hogfish, and grouper provide sport and good eating. Lobster, of course, abound!

Starting early in the day so as to get in as much diving as possible, we meet Bill at the marina. Most local divers bring full suits to protect against cuts and preserve body heat between dives, even though the water is 70 degrees in December.

Having arrived at the dive site, checking the level of air in my tanks, and molding a facemask in place, I drop over the side of the boat in a most ungainly manner with cameras, floatline, and grappling hook. Piercing that thinnest of membranes separating the sea and the air, my body seems to dissolve in the clear, warm water of the Gulf Stream as it begins to absorb all of my weight.

I hang, seemingly without motion, above a sea floor I can

not see some 130 feet below. I am drifting with the boat, not aware of the mighty current sweeping us along at three knots. Unreeling some line, I descend.

I can see the first sign of the sea floor at 60 feet beneath the surface. The sunlight, reflecting off the white sand bottom, lightens the blue below. A little deeper and the bottom is as blue as the sky. Except for my bubbles there is no up or down. I drop the grappling hook. Rocketing toward the bottom the hook and line arc gracefully into the blue "sky" below.

My partner and I stop at 130 feet, adjusting buoyancy with air into our vests. We are on a sort of ledge jutting 15 feet above the white sand. It is sparsely populated compared to shallow ledges, but teeming with life nevertheless. Bill snatches a lobster, then another, and still a third as I snap picture after picture. It is too short a visit to this depth, so we must work quickly. The water is a bit chilly, though the current is considerably less here at the bottom.

We are so busy we nearly fail to notice a large grouper as it swims out of sight along the ledge. We find a small cave lined with lobster and filled with spotted drums. I drift effortlessly over the bottom, taking more pictures.

We see butterflyfishes, high hats, spotted drums, hogfish, squirrelfish, and others hiding inside the ledge. There are three major groups of fishes on the Ledges. Along with the aforementioned varieties, red snapper, parrotfish, sergeant majors, and groupers are often found inside the small caves of the Ledges. Such fish as barracuda, spadefish, jack crevalle, blue runner, amberjack, yellowtail snapper, porkfish, and sometimes red snapper, are the travelers of the Ledges. Most often these can be seen swimming actively about above the Ledges, often in schools. Other fish have the habit of staying in or near a certain area of a ledge, but will venture forth to check things out or defend a home range. It is this habit that makes the French, gray, and to a lesser extent the queen angelfish so easy to photograph. They seem almost to pose, turning broadside, spreading fins, or facing the diver with head lowered in threat.

Jupiter is a good place to learn to keep an eye out for these general behaviors. Look for the fish that travel in schools, defend an area, or those that hide. Observe their behavior as you approach. Do they show their colors with elaborate fin displays? Do they retreat? Threaten with open jaws? Stir up the bottom or make sounds?

While there are no coral reefs in this part of Florida, the Ledges are just as exciting, perhaps more so. We are not diving in the nursery that is the reef, but in the open ocean. Here only the strong survive. The fish here are large by reef standards. They come to the Ledges to feed, or to hide from predators.

The Ledges run parallel to the coast and the Gulf Stream, arranged tier upon tier like the seats of some giant stadium whose playing field is the Florida Straits. They range from about 40 feet deep to over 150. Some rise only one foot or so

above the bottom, while others are 20 feet high. Each is different from the one before. All are crowded with life.

The Ledges are the remains of ancient coastlines, many thousands of years old created when the sea stood at various levels lower than it does today. Some are the skeletons of old coral reefs that thrived when the water was warmer than it is today. Others are the remains of reefs constructed by tube worms. Still others are submerged beach rock, a kind of rock which forms at the shore line. Coral grows on the Ledges, particularly at the 40 to 70 foot zone, but contribute little to the ledge. The density and quality of life on the Ledges is staggering. Every square inch is alive, breathing with the sponges and corals, eels and fish living inside its crevices.

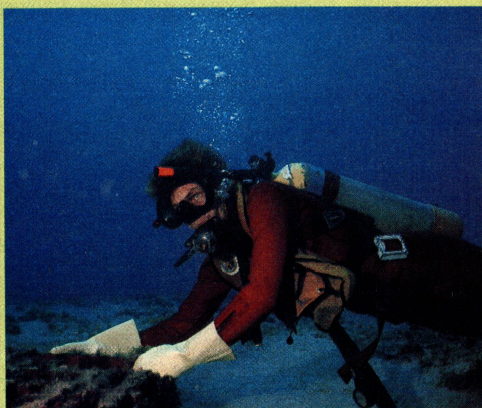
We must return to the surface now to avoid decompression. On up we go, slowly, hand over hand up the float line. I can hear the hum of the pickup boat as it approaches. Bill's bag is bulging with lobster while my camera holds moray eels, porkfish, and even an amberjack.

Visiting Jupiter could not be easier, just a few miles off the beaten path to the Keys. The town is situated on US #1, two miles east of the turnpike. Two dive shops in Jupiter can supply air and equipment. The Holiday Inn is located right on the beach and even affords some snorkeling off its own beach. See Kent Peterson at the Inn to arrange diving, golf, tennis, sailing, skiing, and even helicopter trips.

Open to the public on holidays, the Jupiter lighthouse is an important landmark of historical significance. From the top, high above a flat Florida landscape, excellent views of the ocean to the east, the intracoastal waterway, Jupiter inlet, and the Loxahatchee river can be had. The inlet, even today, is a difficult one to navigate. Many wrecks have piled up on the beaches. The book, *Shipwrecks in the Vicinity of Jupiter Inlet* by Bessie Wilson DuBois provides exciting reading and an informative background in local history. Storms, wars, shifting sand and poor navigation have taken ships of all sizes, including rumrunners and freighters.

Don't pass up a visit to Jonathan Dickinson State Park. A canoe trip in the mangroves is well worth the rental cost. The river meanders through cypress swamp that gradually gives way to the mangroves. These swamps are important to the ecology of the area, and are enjoyable recreational sites as well. The keen eyed visitor may see raccoon, deer, alligators, and wild hog in addition to a huge array of birds and plants.

The Royale Lion is a good place for family feasting, at very reasonable prices and quantity, while the Toby Jug offers fine dining in a more refined atmosphere at higher prices. There are several places for quick, good lunches, with Cornilies being a favorite. You should have no trouble during the season or on weekends in getting out, and into the Gulf Stream. Dives from a 25 foot wreck to ledges 130 feet and everything in between can be arranged. 



photography by Author

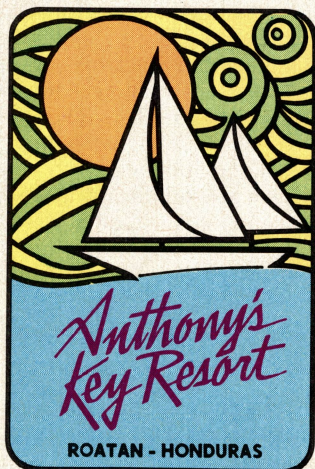
Far left, from the top of the old Jupiter lighthouse, high above a flat Florida landscape, excellent views of the ocean to the east, the intracoastal waterway, Jupiter inlet, and the Loxahatchee river can be had. Left, while drift diving along one of the undersea ledges, Barnacle Bill examines a discarded lobster trap.

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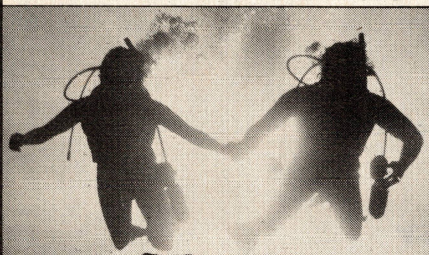
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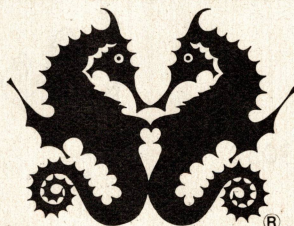
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In a novel concept, a complete international dive and watersport community has been started in Bonaire, N.A. with acquisition of the Bonaire Bungalows by International Subaquatic Industries, Inc. and Cap'n Don Stewart, world renowned scuba operator. John E. Thomas, president of ISI and Captain Don, partners in the enterprise, announced that the bungalow community will be expanded by addition of a dive shop, marine biology laboratory, complete photographic facilities (including darkrooms), a marine library, dispensary, mini market and a diver's bar.



William Morris, Don Stewart, John Thomas and Peter Van Leight discuss plans for Aqua Habitats, a Bonaire bungalow community.

The complex, known as Aqua Habitats, will be operated by Aquaventure, which also manages diving and watersports at the Hotel Bonaire. At present it has 11 cottages and 44 beds.

Aquaventure, founded by Captain Don 12 years ago, is one of the largest and most successful dive operations in the Caribbean. Located on Bonaire, N.A., an island that has taken a farsighted position in protecting its reefs and marine life, Aquaventure provides over 40 active dive sights for scuba divers and miles of prolific reefs for the snorkeler.

The Hotel Bonaire, where the present Aquaventure facilities are headquartered has recently been taken over by Arthur Frommer Hotels, Inc. An extensive program of renovation and upgrading is already underway at the hotel. Aquaventure is continuing to run its watersport and dive facilities.

Daily air service to Bonaire is scheduled from New York via KLM or American Airlines and from Miami via ALM/KLM. All flights connect through Aruba or Curacao to Bonaire. For more information contact the Tourist Information Office, 685 5th Ave., N.Y., N.Y. 10022.

Great White Shark Photo Expedition

After the splendid success of the inaugural expedition, See & Sea Travel has announced their second annual great white shark photo expedition to South Australia, Jan. 29-Feb. 12, 1977.

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On the first expedition they had three different days of filming these elusive, magnificent predators. Each time these great animals appeared it was in groups of two or three, and the show they put on made the divers admire them more than ever. Again and again, they made long, sweeping, silent passes, pausing occasionally to devour a chunk of meat.

The techniques and equipment used were similar to those used for the filming of *Blue Water, White Death* and *Jaws*, and were also used on several subsequent filming expeditions.

Here is your opportunity to film one of the earth's greatest predators. Join Carl Roessler for the 1977 great white shark photographic expedition. For further information, contact See & Sea Travel Service, Inc., 680 Beach Street, San Francisco, California 94109. »

Southern Flies to Cayman

Southern Airways, Inc. in mid-August was named by the Civil Aeronautics Board (CAB) as the permanent United States Flag Carrier to the Cayman Islands, British West Indies.

Southern has provided daily service between Miami, Fla., and Grand Cayman since December 1974, utilizing temporary sanction pending a final decision by the CAB. The permanent authority permits the Atlanta based carrier to fly

to the Cayman Islands from Miami and Fort Lauderdale, Fla.

The airline now offers vacationers and underwater sportsmen one daily afternoon flight from Miami to Grand Cayman, along with a daily afternoon return flight to the mainland. Through Dec. 15, 1976, the off season for vacation travel to the islands, Southern offers group inclusive tour fares that provide reduced rate travel from Miami to Grand Cayman for groups of ten or more travelers. Minimum stay on the islands for this fare is three days, maximum is 14 days.

Skin and scuba divers can learn about the sea life that thrives in the crystal clear waters surrounding the Cayman Islands by viewing *Things That Go Bump in the Night*, a night diving film sponsored by Southern and produced by Jack McKenney, former editor of *SKIN DIVER*. The 22 minute color, sound film is available on a complimentary basis from Southern to private interest groups. Make requests for the 16mm film, well in advance of anticipated showing date, to J. G. Giancola, Sales Division, Southern Airways, Inc., Hartsfield Atlanta International Airport, Atlanta, Ga. 30320. »

Maya Beach Resort, Belize

Belize, formerly British Honduras, is a small, English speaking country located on the east coast of Central America bor-

dering on Mexico to the north, Guatemala to the west and south, and flanked by the Caribbean Sea to the east.

Belize now offers one of the most unusual vacation or sportsman's paradise to be found in the hemisphere in the soon to be opened Maya Beach Resort.

For the scuba diver, an underwater paradise with 200 foot visibilities, underwater caves, beautiful coral formations and an endless variety of marine life can be found off Belize. The tour features an overnight trip to the Blue Hole, a strange crater situated outside the reef and the subject of one of Jacques Cousteau's television specials. For the novice diver or snorkeler, certified dive instructors are on hand to introduce you to the fantastically beautiful and strange world beneath the sea.

The package costs \$750 per person sharing twin accommodations and includes: round trip airfare from Miami or New Orleans via Sahsa or Tan Airlines, transfers from Belize International Airport to Government Docks, cruise from Belize City to Maya Beach Resort, seven nights at the Maya Beach Resort, three meals a day, all sports activities, barbecue, parties, return cruise and all tips, gratuities for items in package, and baggage handling.

For more information and reservations, contact your travel agent or Horizons International, Suite 213, Boeing Field, P.O. Box 80464, Seattle, Wash.



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Dutch Antilles. 8 days. \$695 plus air fare. Includes both Bonaire and Curacao.

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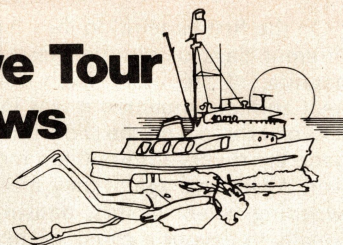
*Per person, double occupancy, Standard accommodations. Superior: \$156. Deluxe: \$171. (Both per person, double occupancy). Rates effective December 1, 1976 through March 14, 1977 and subject to availability. No refunds on unused dives/lessons. Airfare, government tax and tips not included.

For group rates, non-divers rates and more information call SRS TOLL FREE (800) 225-1372. In Massachusetts (800) 842-1202. In Montreal (514) 861-9074. In Toronto (416) 962-5711.

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Dive Tour News



- Nov. 5, 12, 19, 26 — BONAIRE — 8 days, Lisind Int'l, New York, NY
- Nov. 1, 6—BIMINI—5 days, Capt. Tom Guarino, Dive Boat Annie-Up, Key Largo, FL
- Nov. 5, 12, 19, 26 — HAITI — 5 or 8 days, Oceaneers Dive Tours Inc., Hollywood, FL
- Nov. 6, 13, 20, 27—MAYA BEACH BELIZE—8 days, Horizons Int'l, Seattle, WA
- Nov. 6 — CAYMAN ISLANDS — 8 days, See & Sea, San Francisco, CA
- Nov. 6 — FLORIDA KEYS — 7 days, Berry Distributors, Inc., Alsip, IL
- Nov. 7, 23—BAHAMAS—7 days, Tropic Diving Cruises, Inc., Ft. Lauderdale, FL
- Nov. 7—SAN SALVADOR ISLAND, BAHAMAS—World Wide Divers Inc., New York, NY
- Nov. 7—BELIZE—7 days, Go Diving, Inc., Minneapolis, MN
- Nov. 12 — BELIZE — 7 days, NASDS store/school, Denver, CO
- Nov. 12, 19, 26 — BONAIRE — 8 days, Lisind Int'l, New York, NY
- Nov. 12 — BONAIRE — 8 days, Happy Wanderer, Bronxville, NY
- Nov. 12 — COZUMEL — 8 days, Sunland Int'l Tours, Beverly Hills, CA
- Nov. 14—SAN ANDRES—8 days, Go Diving, Inc., Minneapolis, MN
- Nov. 18 — KONA, HAWAII — 5 days, Horizons Int'l, Seattle, WA
- Nov. 19 — BELIZE — 7 days, NASDS store/school, Phoenix, AZ
- Nov. 20—ROATAN—8 days, Go Diving, Inc., Minneapolis, MN
- Nov. 20 — COZUMEL — 8 days, See & Sea Travel, San Francisco, CA
- Nov. 20 — CAYMAN ISLANDS — 8 days, See & Sea Travel, San Francisco, CA
- Nov. 27 — GRAND CAYMAN — 8 days, Jack's Dive Center Inc., Plainville, CT
- Nov. 27—COZUMEL—8 days, Go Diving, Inc., Minneapolis, MN
- Nov. 27 — SEA OF CORTEZ — 9 days, Sunland Int'l Tours, Beverly Hills, CA
- Dec. 3, 12, 27—BAHAMAS—7 days, Tropic Diving Cruises, Inc., Ft. Lauderdale, FL
- Dec. 3 — BONAIRE — 8 days, Happy Wanderer Travel, Scarsdale, NY
- Dec. 3, 10, 17, 24, 30 — BONAIRE — 8 days, Lisind Int'l, New York, NY
- Dec. 3, 10, 17 — HAITI — 5 or 8 days, Oceaneers Dive Tours Inc., Hollywood, FL
- Dec. 4, 11, 18, 25—MAYA BEACH BELIZE—8 days, Horizons Int'l, Seattle, WA
- Dec. 4 — BELIZE — 7 days, NASDS store/school, Huntsville, AL
- Dec. 4—FREEPORT—8 days, Go Diving, Inc., Minneapolis, MN
- Dec. 8 — FLORIDA CAVES — 5 days, Berry Distributors, Inc., Alsip, IL
- Dec. 11 — AKUMAL — 8 days, Lisind Int'l, New York, NY
- Dec. 12—BELIZE—7 days, Go Diving, Inc., Minneapolis, MN

Dec. 14 — AUSTRALIA — 22 days, Pier 161 Scuba Center, Columbus, OH

Dec. 18 — CAYMAN ISLANDS — 10 days, See & Sea Travel, San Francisco, CA

Dec. 18 — COZUMEL — 10 days, See & Sea Travel, San Francisco, CA

Dec. 19 — SAN ANDRES — 8 days, Go Diving, Inc., Minneapolis, MN

Dec. 19 — ROATAN — 8 days, Go Diving, Inc., Minneapolis, MN

Dec. 19 — COZUMEL — 8 days, Go Diving, Inc., Minneapolis, MN

Dec. 19 — FREEPORT — 8 days, Go Diving, Inc., Minneapolis, MN

Dec. 19 — BELIZE — 7 days, Go Diving, Inc., Minneapolis, MN

Dec. 23 — KONA — 7 days, See & Sea Travel, San Francisco, CA

Dec. 24 — SAN SALVADOR — 8 days, Horikzons Int'l, Seattle, WA

Dec. 24 — BONAIRE — 8 days, Happy Wanderer Travel, Scarsdale, NY

Dec. 24 — HAITI — 8 days, Happy Wanderer Travel, Scarsdale, NY

Dec. 24 — HAITI — 10 days, Oceaneers, Hollywood, FL

Dec. 26 — SAN ANDRES — 8 days, Go Diving, Inc., Minneapolis, MN

Dec. 26 — ROATAN — 8 days, Go Diving, Inc., Minneapolis, MN

Dec. 26 — COZUMEL — 8 days, Go Diving, Inc., Minneapolis, MN

Dec. 26 — FREEPORT — 8 days, Go Diving, Inc., Minneapolis, MN

Dec. 26 — BELIZE — 7 days, Go Diving, Inc., Minneapolis, MN

Dec. 27 — COZUMEL — 8 days, Sunland Int'l Tours, Beverly Hills, CA

Dec. 30 — KONA — 7 days, See & Sea Travel, San Francisco, CA

Jan. 1, 8, 15, 22, 29 — MAYA BEACH BELIZE — 8 days, Horizons Int'l, Seattle, WA

Jan. 15 — CAYMAN ISLANDS — 8 days, See & Sea Travel, Inc., San Francisco, CA

Jan. 22 — COZUMEL — 8 days, See & Sea Travel, Inc., San Francisco, CA

Jan. 29 — GREAT WHITE SHARK EXPEDITION — 17 days, See & Sea Travel, San Francisco, CA

Feb. 5, 12, 19, 26 — MAYA BEACH BELIZE — 8 days, Horizons Int'l, Seattle, WA

Feb. 11 — BONAIRE — 8 days, Happy Wanderer Travel, Scarsdale, NY

Feb. 12 — CAYMAN ISLANDS — 8 days, See & Sea Travel, Inc., San Francisco, CA

Feb. 18 — SAN SALVADOR — 8 days, Happy Wanderer Travel, Scarsdale, NY

Feb. 19 — COZUMEL — 8 days, See & Sea Travel, Inc., San Francisco, CA

Feb. 19 — BONAIRE — 8 days, See & Sea Travel, Inc., San Francisco, CA

Mar. 5, 12, 19, 26 — MAYA BEACH BELIZE — 8 days, Horizons Int'l, Seattle, WA

Mar. 9 — GALAPAGOS ISLANDS — 18 days, Jack McKenney, See & Sea, San Francisco, CA

Mar. 12 — CAYMAN ISLANDS — 8 days, See & Sea Travel, Inc., San Francisco, CA

Mar. 19 — COZUMEL — 8 days, See & Sea Travel, Inc., San Francisco, CA

Apr. 2, 9, 16, 23, 30 — MAYA BEACH BELIZE — 8 days, Horizons Int'l, Seattle, WA

Apr. 2 — CAYMAN ISLANDS — 8 days, See & Sea Travel, Inc., San Francisco, CA

Apr. 9 — COZUMEL — 8 days, See & Sea Travel, Inc., San Francisco, CA

Apr. 16 — BONAIRE — 8 days, See & Sea Travel, Inc., San Francisco, CA

Apr. 23 — GRAND CAYMAN — 8 days, Jack's Dive Center Inc., Plainville, CT

Apr. 23 — SAN SALVADOR, BAHAMAS — 8 days, Tri-City Divers, Vernon, CT

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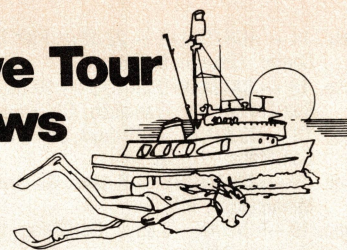
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Dive Tour News



- Apr. 30—REMOTE ISLAND, TAHITI—15 days, Peter Capen, See & Sea, San Francisco, CA
May 4—GALAPAGOS ISLANDS—18 days, Bob Hollis, See & Sea Travel, Inc., San Francisco, CA
May 14—CAYMAN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
May 14—RED SEA, AQABA—15 days, Carl Roesler, See & Sea Travel, Inc., San Francisco, CA
May 21—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA
May 21—BONAIRE—8 days, See & Sea Travel, Inc., San Francisco, CA
June 4—REMOTE ISLANDS, TAHITI—15 days, See & Sea Travel, Inc., San Francisco, CA
June 4—TRUK, MICRONESIA—13 days, See & Sea Travel, Inc., San Francisco, CA
June 11—CAYMAN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
June 18—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA
Jul 2—SAN SALVADOR, BAHAMAS—8 days, Tri-City Divers, Vernon, CT
July 2—TRUK, MICRONESIA—13 days, See & Sea Travel, Inc., San Francisco, CA
July 2—CAYMAN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
July 6—GALAPAGOS ISLANDS—18 days, Paul Humann, See & Sea, San Francisco, CA
July 9—BONAIRE—8 days, See & Sea Travel, Inc., San Francisco, CA
July 16—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA
Aug. 6—TRUK, MICRONESIA—13 days, See & Sea Travel, Inc., San Francisco, CA
Aug. 10—GALAPAGOS ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
Aug. 13—CAYMAN ISLANDS—8 days, See & Sea Travel, Inc., San Francisco, CA
Aug. 20—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA
Aug. 20—BONAIRE—8 days, See & Sea Travel, Inc., San Francisco, CA
Sept. 3—TRUK, MICRONESIA—13 days, See & Sea Travel, Inc., San Francisco, CA
Sept. 10—CAYMAN/ROATAN CRUISE—12 days, See & Sea Travel, Inc., San Francisco, CA
Sept. 17—COZUMEL—8 days, See & Sea Travel, Inc., San Francisco, CA
Sept. 17—BONAIRE—8 days, See & Sea Travel, Inc., San Francisco, CA
Oct. 8—RED SEA/AQABA—15 days, See & Sea Travel, San Francisco, CA
Oct. 11—AUSTRALIA/CORAL SEA—17 days, See & Sea Travel, San Francisco, CA
Oct. 15—COZUMEL—8 days, See & Sea Travel, San Francisco, CA
Oct. 22—CAYMAN ISLANDS—8 days, See & Sea Travel, San Francisco, CA
Oct. 25—AUSTRALIA/CORAL SEA—17 days, Jack McKenney, See & Sea, San Francisco, CA
Nov. 19—CAYMAN ISLANDS—8 days, See & Sea Travel, San Francisco, CA
Nov. 19—COZUMEL—8 days, See & Sea Travel, San Francisco, CA
Dec. 20—CAYMAN ISLANDS—10 days, Christmas Cruise, See & Sea, San Francisco, CA
Dec. 20—COZUMEL—10 days, Christmas program, See & Sea, San Francisco, CA

Divers Unlimited In Haiti

Dave Inman of Divers Unlimited, and Stanley Goldsmith of Oceaneers Dive Tours, both located in Hollywood, Florida, have announced the opening of the new dive center at the Kaloa Beach Hotel in Haiti. The Kaloa Beach Hotel is located 30 miles north of Port au Prince on a white sand beach situated at the foot of the mountain range, ideally combining diving with a delightful vacation.

Captain Phil Chalker, formerly of Tropic Diving Cruises, is the managing director of the dive operation. Captain Chalker, well-known for his former charter trips in the Bahamas, is not a newcomer to diving. A former chemical salesman in Michigan, Captain Phil first became interested in diving in 1963 on a vacation in the Bahamas. As the president of a Michigan dive club, he ran many weekend charters in the Straits of Mackinaw, becoming an experienced salvage and wreck diver. In early 1970 Captain Phil purchased a 40-foot Nova Scotia and relocated to the Bahamas to run charter trips. It was on one of his trips that he discovered a blue hole in the Bimini chain of the western Bahamas. This is now known as Chalker's Blue Hole.

Diving in Haiti is breathtaking with a wide variety of dives ranging from shallow depths to spectacular wall dives. A large assortment of corals, sponges, and tropical fish abound in the clear 85' water. Dive sites include the Arcadins and the Island of La Gonave.

The new dive center, Divers Unlimited of Haiti, is equipped with over 50 tanks, which are kept filled by one of the two compressors. Rental gear for either scuba diving or snorkeling is available. Trips are run from a 40-foot dive boat, the Reef Roamer. Plans are now underway for a second boat.

The Kaloa Beach Hotel consists of 30 private bungalows directly on the beach surrounded by exotic tropical flowers and vegetation. Dining is in an open air thatched dining hall which has a delightful cooling breeze at night which accounts for the absence of all irritating insects commonly found in tropic resorts. Many sports are available for recreation after your diving or if you have a non-diver in your party: tennis, horseback riding, sailing, or swimming in the freshwater pool which includes a bar to quench your thirst. Eight day trips include a day's trip into Port-au-Prince for shopping for native carvings or art work at bargain prices. A highlight of the trips is a visit to an actual voodoo ceremony. Also included is a trip to a native fishing village on the island of La Gonave where you barter for excellent specimens of various shells. For bookings or further information, call Oceaneers at (800) 327-3810, toll free from anywhere in the United States, except Florida. For those in Florida, call (305) 983-0017.

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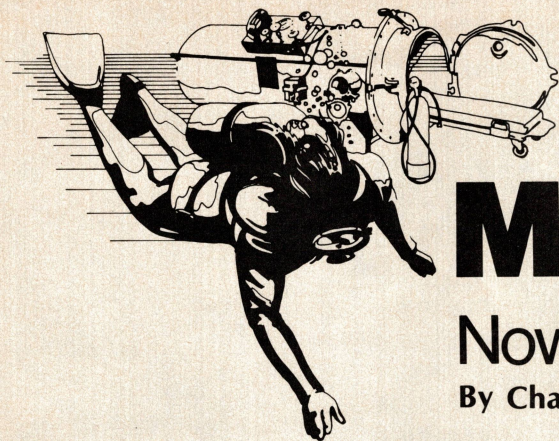
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Medifacts

Now Hear This

By Charles V. Brown, M.D.

The issue is debated, the question is called, and the ears have it: number one for nuisance, up time, and dropout among divers. Many old salts are in fact indelibly earmarked. They have bony overgrowth in their external canals, possibly a response to local cold stress. Many show at least minor eardrum changes from repeated mild barotrauma. Incidentally, if a person who acts the hot shot diver has much wax in his ears, he's putting you on; frequent dunkings keep it washed out.

Understanding ear problems requires a good idea of how this rather complex organ works, so we'll review. The ear is our only sensor for hearing, and a major one for detecting orientation and motion. The external ear collects sound waves and conducts them to the eardrum. The middle ear is an air filled space which communicates through the eustachian tube with the throat. It contains a chain of three ossicles (Latin for little bones), called the malleus, incus, and stapes (Latin for hammer, anvil, and stirrup). These conduct the sound waves from the eardrum to the oval window diaphragm, and amplify them in the process. The oval window is an opening in the bony wall between the middle and inner ear.

The inner ear contains the cochlea, for hearing, and the vestibular apparatus, for equilibrium. The cochlea is a spiral tube filled with fluid and lined with tiny hairs that are really auditory nerve endings. The fluid transmits vibrations from the oval window to the appropriate hairs, which flash their message to the brain. Since the vibrations are really sizable back and forth movements of the cochlear fluid, a second window is needed at the end of the line for pressure relief. This is the oval window, also situated between the inner and middle ear. Its diaphragm moves out when the oval diaphragm moves in, and vice versa.

The vestibular apparatus is a system of canals and chambers, filled with fluid, and lined in strategic places with tiny

hairs that are really vestibular nerve endings. The chambers (sacculi and utricle) contain otoliths, miniature stones that are denser than water and so keep trying to sink. Whichever hairs they sink against must be the most downhill at the moment, and this tells the brain whether the head is upright, tilted, or whatever. And if you start to move in any straight direction, the acceleration thrusts the otoliths backwards relative to your motion, again stimulating nerve endings.

The canals in the inner ear are called the semicircular canals, but they actually make three complete loops in three perpendicular planes. They detect rotatory motion in any plane. Boaters and flyers would think of it as analyzing pitch, roll, and yaw. You can rotate a tea cup and see that the tea, held back by its own inertia, at first refuses to spin. This causes a backward current of tea relative to the cup. When your head turns, the same thing happens in the semicircular canals, and the resulting current stimulates their nerve endings. To be precise, what is detected is change of motion, or acceleration; the sensors don't respond to constant steady motion.

So much for ear function. Now let's look at dysfunction. The major manifestations are pain, hearing deficit, tinnitus (ringing in the ears), loss of equilibrium, and the sensation of spinning called vertigo. Pain usually results from squeeze. This is the single most common disorder in diving, but we'll only mention it here, since it's the subject of a future article. We will discuss decrements in hearing, and then in equilibrium.

A serious reduction in hearing is intrinsic to diving. Sound waves in the air tend to bounce off the water surface and never reach the diver. Wet suit hoods make great sound insulators. Wax accumulations can swell in water, blocking the canal. And man underwater is ill adapted to receive and interpret any sounds that do reach him. For awfully complex reasons, including a huge impedance mismatch between air and

water, the external ear becomes virtually useless for conducting sound. We hear instead by bone conduction. Vibrations in the water bypass the air in the canals, and vibrate the bones of the head.

Water conducts sound four to five times faster than air, and also farther. That at least should be a plus, but the advantage is illusory. A sound underwater must be louder before you can hear it, and worse yet, you'll have trouble telling which direction it's coming from. Where, for instance, is the motor boat? On land we locate a sound's source by its relative loudness in our two ears. The ear directed toward the sound gets the full force of its waves, while the other ear, being so to speak in the shadow of the head, receives much less sound energy. When we face the sound source, the loudness becomes the same in both ears. But with bone conduction underwater, sound reaching one side of the skull vibrates the whole skull, and both cochleas, with about the same amplitude, so there's no discernible difference.

Another clue on land might be the phase difference of sound waves reaching one ear slightly later than the other. The ear closer to the source might catch a wave on the beginning of its upswing, and the other ear catch it a bit higher on its upswing. A computer in the brain could then deduce from this information the angle from which the sound was coming. Underwater however, the fast transmission of sound brings the waves to both ears almost simultaneously, and the computer can't cope. Nevertheless, experiments show that a diver often can home in on a stationary underwater sound source by using the method of successive approximations. He estimates the direction incorrectly, but does get a little closer, and then stops and estimates again, and again.

Abnormal, or disease related, hearing defects are incurred in several ways. Middle ear infection is a common one. Noise damage is a threat mainly to commercial divers and others who use hel-

ments and decompression chambers frequently. Pressure damage, called barotrauma, may affect any diver. Decompression sickness can put a bubble in his cochlea or one of the blood vessels supplying it. We have seen an eardrum that burst when its owner hit the water sideways during a sloppy entry. The Australians reported eardrum rupture by the shock wave of a fin kick near a luckless head. Underwater explosion threatens some military and commercial divers, and even sport divers if a prankster with firecrackers is around.

Hearing deficit which results from diving can be mild or serious, transient or permanent. Depending on the cause, it may call for no treatment, for medication, for recompression, or for surgery. Its correct diagnosis requires an otoscope and sometimes more sophisticated equipment. Every case which lasts more than a few hours therefore deserves evaluation by a doctor who knows about dive disorders, and the same applies to any other ear symptom.

Next month we'll conclude our look at ear problems with a discussion of disorientation below. 🐠

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Brochures giving complete details on all Scubamerica dive tours may be obtained by writing to Scubamerica Diving Adventures, P.O. Box 9000, Van Nuys, California 91406. 🐠

Peter Philp With World Wide

Peter Philp has been appointed the new dive master for World Wide Divers, Inc. As dive master, he will be in charge of all phases of instruction, certification, advanced training programs, as well as all of the instructors.

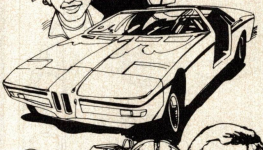
Philp is a 1970 graduate of the University of Maryland, was certified by NAUI in 1967 and became a certified NAUI instructor in 1973. employee of the U.S. Government from 1971 to 1973 he assisted and taught open water training courses on the island of Crete. From 1973 to 1975 he was the dive master for Teach Tours, in Bateaux Bay, Tobago. 🐠

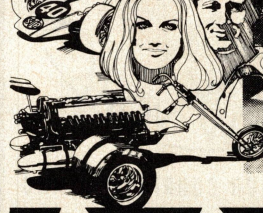
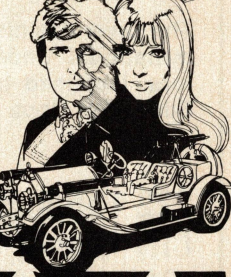


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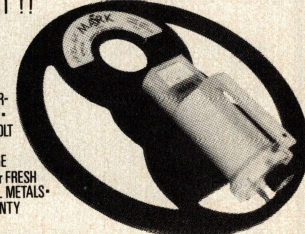


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TREASURE

Everyone loves the excitement of a treasure hunt and the 500 or so divers who converge annually in June at Presquile Provincial Park, Ontario, Canada, (approximately 90 miles east of Toronto) are no exception. But this is a different kind of treasure. Donations from various dive shops, dive gear manufacturers, sports shops and dive clubs, which totalled some \$7,600.00 this year, make up the 'Treasure'.

Every diver who finds a weighted flag underwater within the required time of one hour is entitled to enter his name and his buddy's name in a draw from which the many prizes are picked. Duplicate prizes are presented to each buddy team whose names are chosen and only one flag for each two-man team is dropped into the water. As a gesture of true sportsmanship, even those who do not find a flag have their names entered into a "loser's draw" for some small prize.

The prizes create the main attraction to this event. The collection ranges from the smallest — beach whistles, bottles of 'defog', air fills, masks, fins, snorkels, wet suit boots, hoods, depth gauges, to regulators, wet suits, tanks, buoyancy compensators, an unusual prize this year of lawn furniture; dive expenses at the Ichatucknee River, Ft. White, Florida; accommodation, diving and meals at Key Largo sponsored by Key Largo Diving Headquarters, which lead to the top two prizes this year of a stay for two at the Andros Beach Hotel, Small Hope Bay, Andros, Bahamas, provided by Dick and Rose Birch, and the grand prize of an all-expense paid trip for two to Grand Cayman Island at the Holiday Inn, donated by Carl Strassburger of Aquaventure Travel, Toronto.

Joe and Carol Caputo of Sub-Mariners Diving Equipment, Toronto, are the hosts of this marathon event. Although Saturday night marks the official opening with a dinner and dance at a nearby Legion Hall, some divers make a weekend out of it by arriving at the park Friday night equipped with camping gear and goodies for the weekend. This year about 275 attended the dance, and a TV set, polaroid camera, transistor radio, record albums and such, were given out as door prizes and spot dance prizes.

By 9 a.m. Sunday, the park started to come alive with campers awakening, photographers, tourists, children and dogs trickling through the gates. They come from all over — Ontario, Quebec, Michigan and New York. At least 1300 cars were counted coming through the park entrance for the occasion. Nothing is overlooked at this event — sun, fun and free hotdogs for everyone.

After all the divers are registered, the flags are distributed in the water by boat,

ONTARIO CREATES IT'S OWN

By Linda Chambers



photography by Morley Eveleigh

into a buoyed-off area in silty, weedy water about 15 feet deep and a half-mile in diameter. The flags are numbered to keep track of the amount of flags put in the water (one per team), and to avoid confusion, the color of the flags are changed each year.

Safety boats are placed strategically around the outside of the buoyed-off area with the LaSalle Rescue boat in the center. Each boat is manned with a boat

handler, a radioman courtesy of Metro General Radio Service and a safety diver. The St. John's Ambulance men are always on hand and the O'Keefe Sports Van was used this year for landbase headquarters and for communication.

As the hunt nears commencement, suited up divers waded into the water up to their knees to await the starting gun. Tom McCollum, underwater cinematographer of T.A.M. Dive, Toronto, Ontario,

drew a good comparison of the scene on the beach just before the great plunge took place — "it reminds me of a herd of harp seals I have seen on the ice floes near the Magdalen Islands in the Gulf of St. Lawrence!" This was the first attempt this year to film the event underwater, but because of the wave action, the divers so spread out, and the bottom so easily stirred up, the idea was abandoned.

The crowd on shore was hushed, the air tense. Suddenly the gun cracked and the level of Lake Ontario appeared to rise about two feet! One minute there were 540 divers on the beach and the next, everybody had disappeared out of sight. The water seemed to have swallowed them up! The beach was like a ghost town except for the spectators further back, waiting and watching for their knight in black rubber to emerge, flag in hand. It did not take long for some teams to find one and within minutes heads starting breaking the surface, either with the 'treasured flag', or to take new bearings. Then slowly, two at a time, divers ascended from the depths proudly waving a numbered flag and then regrouped

(Continued on Page 90)

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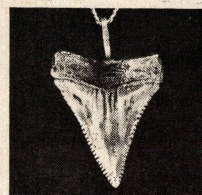


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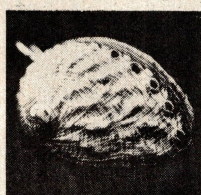
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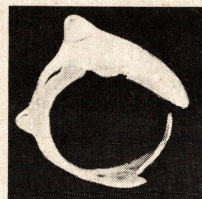
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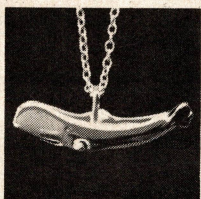
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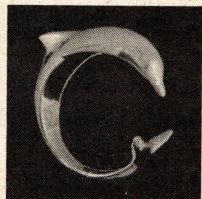
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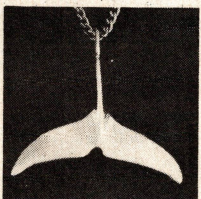
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Treasure

(Continued from Page 89)

at the registration desk to report safely in.

With everyone checked in, Joe Caputo stepped up to the microphone to announce the draw for prizes would soon begin. The tension during the draw becomes almost unbearable till the draw finally reaches a crescendo and the grand prizes are drawn. There are screams of delight from the winners and groans from the losers and the Treasure Hunt is over for another year.

There have been five Treasure Hunts to date, all successful and all accident free. The strictest of safety rules are adhered to. Every diver must present a recognized certification card.

Joe and Carol see this Treasure Hunt as a growing, continual, yearly event, with the prizes getting bigger and better. The chief emphasis of course is safety first and fun second. Old and new friends bid farewell with mutual promises to return next year to try once again for the big prize. Think about joining them for the 'hunt' next year — June 12, 1977.

High Dive

(Continued from Page 33)

functioned perfectly, keeping us amazingly warm and dry.

Seven divers entered Lake Waiau on the morning of April 4, 1976. The participants were Mark Murray, owner of a luxury dive catamaran, the *Alii Nui*, that serves the Mauna Kea Beach Hotel; Dave Norquist, marine mammal trainer and professional aquarium fish collector; Mick Mathewson, NAUI instructor and commercial pilot; Geoff Daigle, NAUI instructor and dive physiologist; Tom Adams, whale enthusiast, NAUI instructor and dive physiologist; Dr. Glen Egstrom, expert in dive technology and physiology at UCLA, and the author. All except Egstrom are Big Island residents.

It was a black, cold and rainy morning when our team of divers with assistants, journalists and television crew assembled in Waimea long before first light. The caravan of four wheel drive vehicles paused at a campground at 6000 feet in order to don SuperSuits and stage our gear before it became too cold outside to expose bare skin. Two hours later when we reached the summit, the weather had developed into ideal conditions for the attempt. We had been concerned about the weather, because a scouting trip the week before had been cut short by a blinding blizzard. Even this day, the jeeps could not plow through the high snow drifts, so we had to pack our equipment across the plains of snow. Every team member had derived his own system of gear transport, ranging from willing friends, to surf mat and

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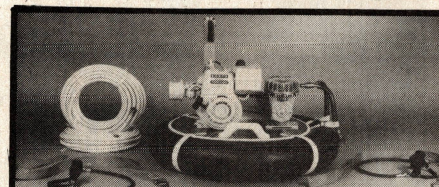
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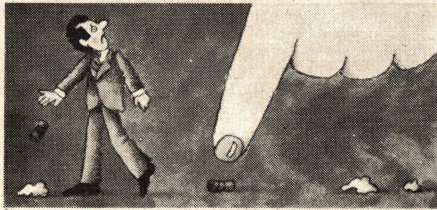
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water ski sleds. There was a definite congregation around Mark Murray, who toted the oxygen bottles. One hit from Murray gave us motivation but even the slightest grade brought us nearly to a standstill. It took us over an hour of hard exertion to reach the lake. Several skiers joined our ranks just to see what these people in colorful, rubber suits were up to. The air temperature was a brisk 40° with an increasing breeze; but the divers were sweating in their SuperSuits while the onlookers stomped their feet and bundled up their parkas. At lakeside there was breathless confusion as we tried to sort out our equipment. One regulator had become so packed with snow that it began free flowing.

We were all panting from exertion and lack of oxygen and I imagine everyone had second thoughts, but finally we were ready. The result of months of idle talk, speculation and concerned preparation were now at hand. The water looked turbid from the surface and we knew it was cold, although the night ice had already melted. We divided into photographers, sample collectors, and explorers, and entered the water together. We paddled to the center of the lake and descended into the greenest, murkiest water any of us had ever experienced.

With visibility at best 1 meter, Adams and I sort of swam into the bottom before recognizing it. It was covered with a thick mat of red, green and brown colored algae that formed a complicated pattern of layers, tunnels and columns. We could easily plunge our arms shoulder deep without striking hard substrate. Norquist spotted the only animal large enough to be easily seen, an unidentified pink worm. Some of the early explorers of the volcano reported the lake to be very deep (one said bottomless) and while others reported it to be less than 3 meters in depth. The deepest section we found was near the center of the lake and it seemed to be about 20 feet in depth, although our depth gauges were useless at that altitude.

The actual diving was certainly the most comfortable part of the endeavor. Once in the water, our tanks and heavy 25 pound weight belts were buoyed by the ballooned dry suits. We were being supplied plenty of oxygen from the compressed air. Within 20 minutes, we had completed our assignments and emerged — each diver elated by success, but weary of retracing his steps. It certainly was a bizarre experience to feel entirely comfortable in such a radical environment, yet look up and see lofty snow covered peaks and skiers in racing suits and goggles. Hot showers and champagne at 6000 feet found a smiling group of adventurers with a brand new story that we prize so much as divers. Lake Waiau has now been designated a wild life sanctuary and entry prohibited — probably no one else will dive those freezing, murky waters near the summit of the world's largest mountain.

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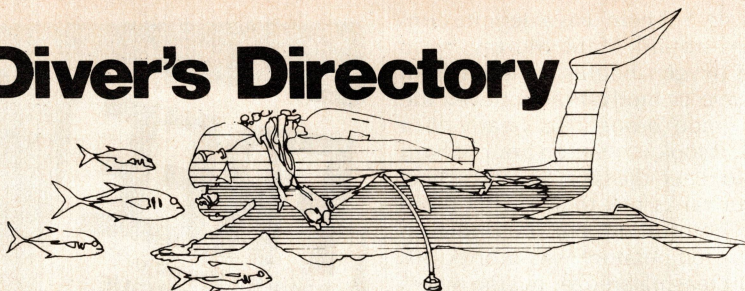
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Wreck Diving Trips Every Weekend

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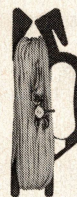
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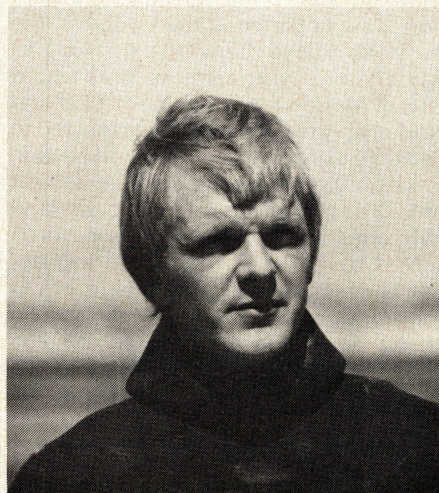
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Lambourne Joins PADI College

Ed Brawley has announced that Michael Lambourne is being added to the Professional Diving Instructor College staff in Monterey, California. Mike's background as Diving Officer on a nuclear submarine in the Royal Navy gives him an academic background that is un-



surpassed. After leaving the Navy, Mike had experience in Grand Cayman operating a resort, which gave him valuable warmwater experience handling and teaching tourists.

This addition to the staff, Brawley says, was in response to many requests for dive instructors with boat operation abilities and Lambourne will be assigned that responsibility.

ACUC General Assembly in Dec

The Medical and Preventive Commission of the World Underwater Federation (Confederation Mondiale des Activités Subaquatiques) will hold its annual general assembly in Toronto, Canada, Sunday, December 5.

Canada, through its delegate, R. T. Towson, M.D., director of the Association of Canadian Underwater Councils, is the host of this year's meeting.

Preliminary plans call for a two day scientific meeting preceding the meeting of the commission. Contributions from diving doctors and others with expertise in hyperbaric medicine from many countries of the world will be presented.

Dr. Bachrach, president elect, Undersea Medical Society and member of the commission, will lend the support of his group and major contributions are expected from Canadian workers in the field. Canada has long been recognized as being in the forefront of hyperbaric medicine research.

Further details of the program may be obtained from R. T. Towson, M.D., % Association of Canadian Underwater Councils, 333 River Road, Vanier City, Canada, K1L 8B9.

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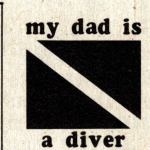
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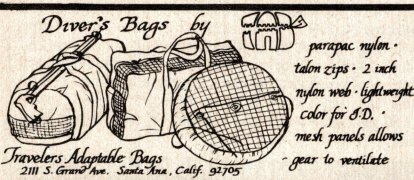
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Downunder '77

Australia plays host to delegates from over 50 nations at the Fifth World Underwater Congress of the Confederation Mondiale des Activites Subaquatiques (CMAS) in September 1977. The organizing group, the Australian Underwater Federation, is sparing no effort to make it a unique and rewarding event.

In addition to the scientific information to be imparted at the Congress, the Australians have chartered a ship for a 12 day cruise to visit areas such as Lizard Island, Marion Reef, Saumarez Reef and Noumea. Although 3000 are expected to be at the Congress, only 750 will be able to be on the cruise. An advance deposit of \$200 is payable now for the cruise and will offer space on a first-come-first-served basis. Total cost of the trip depends on accommodations with prices starting at \$600. The cruise departs on September 14 and returns September 25.

Group air space from the West Coast to Australia will be via Qantas Airlines. The cost will run \$835 from San Francisco or L.A. round trip to Brisbane.

Technical sessions for the Congress commence in Brisbane, Queensland, between September 10-13, 1977. Other conferences which are being held in conjunction with Downunder '77 are: Second International Conference on Artificial Reefs, First World Symposium on Underwater Sports Medicine, International Conference on Maritime Archaeology, and International Conference/Workshop on Underwater Photography. Deposits are also now being taken to ensure participation as a delegate at the Congress at \$250.

For further information on the Fifth Underwater Congress or the Congress Cruise, contact: Bay Travel, Inc., Downunder '77, 2435 East Coast Highway, Corona Del Mar, Calif. 92625; or call (714) 675-4320.

Int'l Symposium '77 In New Orleans

The Association of Diving Contractors will sponsor the International Diving Symposium '77 in New Orleans at the Hyatt-Regency Hotel on January 18-20.

The program will be formulated to include the most important subjects currently related to commercial and military diving activity. In addition, the Symposium will feature a complete display of the latest dive equipment along with numerous technical exhibits.

The Association was founded in 1968 and is devoted primarily to fostering a scientific approach to diving with special emphasis on training and safety.

For more info, write to: Hugh Dan Wilson, Chairman, Papers Selection Committee, Association of Diving Contractors, P.O. Box 454, Belle Chasse, La.

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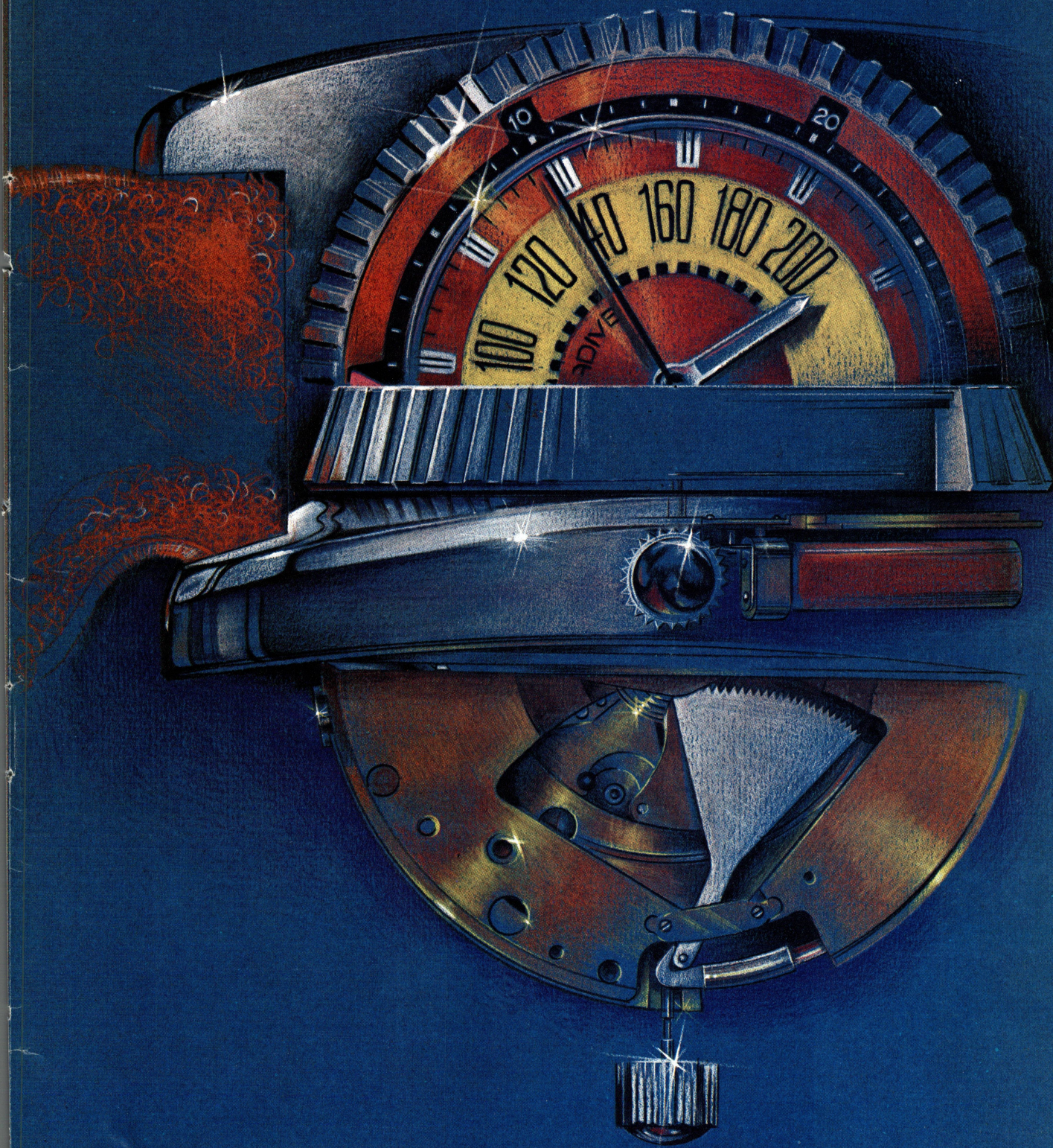
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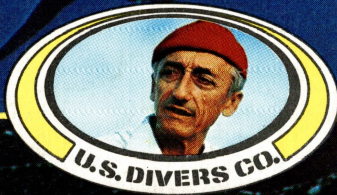
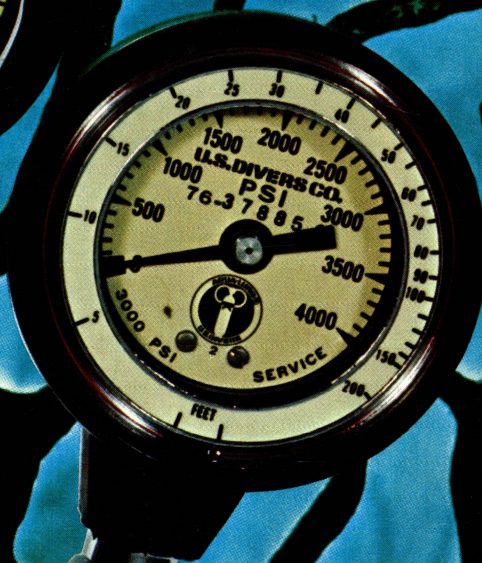
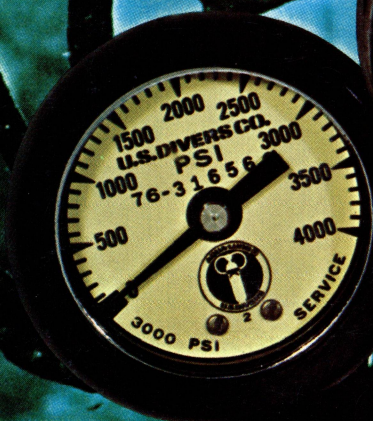
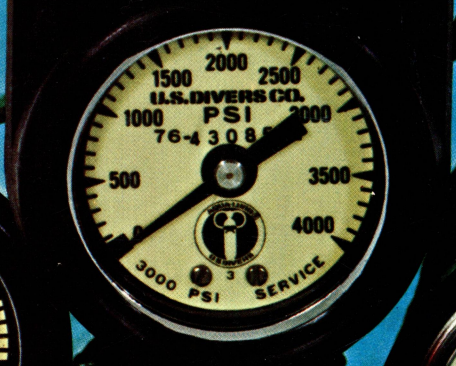
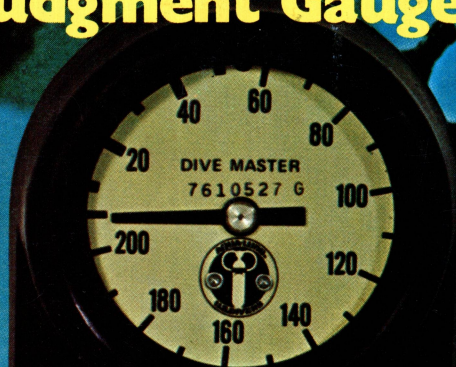


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